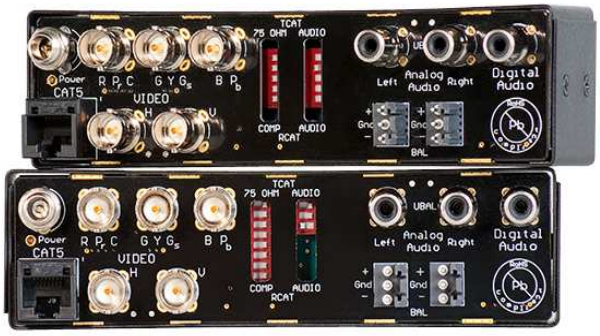
CAT
Video Distribution System

Operation and Technical Manual



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Warnings, Cautions and Others

Mises en garde, precautions et indications diverses

WARNING TO REDUCE THE RISK OF FIRE OR ELECTRICAL SHOCK:

- DO CONNECT CHASSIS TO PROTECTIVE (SAFETY) EARTH WITH SUPPLIED POWER CABLE,
- DO NOT OPEN,
- DO NOT REMOVE THE COVER (OR BACK),
- DO NOT EXPOSE TO AN EXPLOSIVE ATMOSPHERE,
- DO NOT EXPOSE TO RAIN OR MOISTURE,
- DO NOT BLOCK THE POWER PLUG LOCATION,
- DO NOT ATEMPT TO SERVICE, NO USER SERVICE PARTS INSIDE,
- DO NOT ATEMPT TO PERFORM UNAUTHORIZED MODIFICATIONS,
- DISCONNECT THE MAINS PLUG TO SHUT THE POWER OFF COMPLETELY.

The lightning flash with arrowhead symbol, within an equilateral triangle, is intended to alert the user to the presence of uninsulated “dangerous voltage” within the product’s enclosure that may be of sufficient magnitude to constitute a risk of electric shock to persons.

The exclamation point, within an equilateral triangle, is intended to alert the user to the presence of important operating and maintenance (servicing) instructions in the literature accompanying the appliance.

For U.S.A.

NOTE: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna
- Increase the separation between the equipment and receiver
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected
- Consult the dealer or an experienced radio/TV technician for help

For Canada/pour le Canada

CAUTION: TO PREVENT ELECTRIC SHOCK, MATCH WIDE BLADE OF PLUG TO WIDE SLOT, FULLY INSERT. ATTENTION: POUR EVITER LES CHOCS ELECTRIQUES, INTRODUIRE LA LAME LA PLUS LARGE DE LA FICHE DANS LA BORNE CORRESPONDANTE DE LA PRISE ET POUSSER JUSQUAU FOND.

This Class A digital apparatus complies with Canadian ICES-003.
Cet appareil numérique de la Classe A est conforme à la norme NMB-003 du Canada.

• Do not block the ventilation openings or holes.
(If the ventilation openings or holes are blocked by a newspaper or cloth, etc., the heat may not be able to get out.)
• Do not place any naked flame sources, such as lighted candles, on the apparatus.
• When discarding batteries, environmental problems must be considered and local rules or laws governing the disposal of these batteries must be followed strictly.
• Do not use this apparatus in a bathroom or places with water. Also do not place any containers filled with water or liquids (such as cosmetics or medicines, flower vases, potted plants, cups, etc.) on top of this apparatus.

ATTENTION:
• Ne bloquez pas es orifices ou es trous de ventilation. (Si es orifices ou es trous de ventilation sont bloqués par un journal un tissu, etc., la chaleur peut ne pas être évacuée correctement de l'appareil)
• Ne placez aucune source de flamme nue, telle qu'une bougie, sur l'appareil.
• Lors de la mise au rebut des piles, veuillez prendre en considération es problèmes de l'environnement et suivre strictement les règles et les lois locales sur la mise au rebut des piles.
• N'utilisez pas cet appareil dans une salle de bain ou un autre endroit avec de l'eau.

• Ne placez aucune récipient contenant de l'ear (tel que des cosmétiques ou des médicaments, un vase de fleurs, un pot de fleurs, une tasse, uec.) sur cet appareil.

ATTENTION
Afin d'éviter tout risque d'électrocution, d'incendie, etc.:
1. Ne pas enlever es vis ni es panneaux et ne pas ouvrir le coff ret de l'appareil.
2. Ne pas exposer l'appareil a la pluie ni a l'humidité.

Caution — STANDBY/ON switch!
Disconnect the mains plug to shut the power off completely. The STANDBY/ON switch in any position does not disconnect the mains line. The power cannot be remote controlled.
Attention — Commutateur STANDBY/ON!
Déconnecter la fiche de secteur pour couper complètement le courant. Le commutateur STANDBY/ON ne coupe jamais complètement la ligne de secteur, quelle que soit sa position. Le courant ne peut être télécommandé.

RoHS – Restriction of Hazardous Substances

The RoHS Directive, enacted by the European Union (EU), restricts the use of six hazardous substances (lead, mercury, cadmium, hexavalent chromium, polybrominated biphenyls or polybrominated diphenyl ethers) within electrical and electronic equipment. The goal, consistent with other international regulations, is to contribute to human health and the environment by restricting the use of these hazardous substances in new equipment. Manufacturers of electronics products outside Europe must abide by this legislation if the equipment they produce is ultimately imported in an EU member state. This equipment complies with the RoHS directive 2002/95/EC.

Initial Inspection

Before shipment, this unit was inspected and found to be free of mechanical and electrical defects. As soon as the unit is received, inspect for any damage that may have occurred in transit. Save all packing materials in case that the unit has to be returned. If damage is found, please file a claim with the carrier immediately. Do not return the unit to Knox Video Technologies without prior approval.

Limited Warranty

Unless otherwise stated in the product specific documentation received with this product, Knox Video Technologies provides a five-year limited warranty for this product. The above warranty period shall begin on the date of shipment by Knox to purchaser or, if purchaser is an authorized reseller of such Knox products, from the date of shipment by the reseller to the reseller's original customer. The warranty set forth above shall not apply to failure or deficiency, which has been caused by misuse, abnormal or unusually heavy use, neglect, alteration, improper installation, unauthorized repair or modification, improper testing, accidental or causes external to the product such as but not limited to excessive heat or humidity, power failure, or improper installation.

This warranty gives you specific legal rights, and you may have other rights, which vary from state to state.

IF SERVICE IS REQUIRED:

If the product does not perform as warranted, call Knox Video Technologies at *301-840-5805* for available service options. If it is necessary to return an item to Knox Video Technologies obtain a Return Authorization, RA, number prior to returning the product. When returning the product, the defective product should be securely packaged in original boxes and insured for shipment. Place the RA number on the outside and inside of the package. Include a description of the problem with the product. Owner agrees to insure and accept all liability for loss of or damage to this product.

YOU MUST CALL TECHNICAL SUPPORT AT *301-840-5805* FOR A RETURN AUTHORIZATION NUMBER (RMA) AND "SHIP-TO" ADDRESS BEFORE SHIPPING ANY PRODUCT TO KNOX VIDEO TECHNOLOGIES.

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SECTION 1. GENERAL INFORMATION

1.1 INTRODUCTION

The KNOX CAT VIDEO DISTRIBUTION SYSTEM is a pair of devices, which accepts audio and video signals and aggregates them into an arrangement capable of being extended over ordinary unshielded twisted-pair Category 5, 5e or 6 cables. For improved distances nano-skew cable may also be used. Featuring field configurable engineering, the Knox CAT Video Distribution System can be quickly and easily re-configured for several modes of operation. The system supports resolution and refresh rates up to QXGA (2048x1536 @ 60 Hz) and HDTV of 720p, 1080i and 1080p60.

CAT5/5e/6/nano-skew cabling must be pinned to the TIA-EIA T568B wiring specification. This equipment is not intended for, nor does it support, connection through an Ethernet network. Do not connect these outputs to any sort of networking or telecommunications equipment.

1.2 TECHNICAL DESCRIPTION

The CAT Video Distribution System uses an advanced instigated circuit with triple differential twisted-pair drivers and receivers with common-mode sync encoding. The high bandwidth enables differential signaling onto standard twisted-pair with very low harmonic distortion, while internal feedback ensures balanced gain and phase at the outputs reducing radiated EMI and harmonics.

The CAT Video Distribution System must be deployed as pairs of units. The customer will always need to use at least one t-CAT (transmitter) unit and one r-CAT (receiver) unit. The t-CAT unit will be connected to the source of the video (and possibly to the source of some audio as well). A length of cable will connect the t-CAT unit to the r-CAT unit. The cable can be CAT5, CAT5e, CAT6, or nano-skew cable. Whichever cable is used, the cable is a “straight” EIA 568B cable wiring and is terminated with RJ-45 connectors. The r-CAT unit will be connected to the video display device (and audio, if delivered, will be connected to an amplifying device). The system will transport video supplied in several formats. Despite accepting multiple formats, the system will not convert from one format to another format.

The user has a choice of digital (known as S/PDIF), or analog. For analog, the user also has a choice of unbalanced, or balanced stereo, or mono. See below for details. Both units will handle the same audio options.

1.2.1 VIDEO FORMATS

Composite (CVBS) on a BNC connector, or
Y/C (S-Video) on 2 BNC connectors, or
Component (Y,Pb,Pr/RGsB/YUV) on 3 BNC connectors, or
RGBVH on 5 BNC connectors.

1.2.2 AUDIO FORMATS

Analog Monaural (mono) audio,
Analog Stereo audio, or
Digital audio (S/PDIF).

1.2.3 AUDIO ELECTRICAL TRANSMISSION

Unbalanced on RCA connectors or
Balanced on 3 screw WECO terminal connectors,
S/PDIF (digital audio) on RCA connector.

1.2.4 LENGTH FROM t-CAT TO r-CAT

The CAT Video Distribution System was designed to operate in 1 of 4 ranges when correctly set to the actual length range of the cable interconnecting the t-CAT and r-CAT units (double the distances for nano-skew).

Short	1 to 75 feet
Medium short	76 to 150 feet
Medium long	151 to 300 feet
Long	301 to 450 feet

1.3 DETAIL SPECIFICATIONS

Video Channels:	
Levels:	1V p-p
Frequency Response:	DC to 350MHz @ 1v <3dB down at 300MHz
Input Impedance:	75 Ohms
Output Impedance:	75 Ohms
Crosstalk:	less than -70dB@5MHz
Connectors:	
75Ohm female BNC	
Optional RJ-45 female (CAT 5/6/nano-skew cable)	
Maximum DC Input:	+/-0.5V

Audio Channels	
Audio General Analog	
Nominal level:	
Analog unbalanced	0 dbu (775 mV)
Analog balanced	0 dbu (775 mV)
Digital (only unbalanced)	0.5 V
Frequency response:	20 Hz to 20 kHz
THD + Noise:	0.05% @ 1 kHz at nominal level
S/N:	>80 dB, balanced, at maximum output, unweighted
Crosstalk:	<-70 dB @ 1 kHz
Stereo channel separation:	>70 dB @ 1 kHz
CMRR for balanced:	>65 dB @ 20 Hz to 20 kHz
Max Input Level:	+24 dbu
Max Output Level:	+24 dbu
Gain:	0db (unity)
Input Impedance:	
Balanced	600 Ohms
Unbalanced	4.7K Ohms
Digital switchable	75 Ohms or Hi-Z
Output Impedance:	
Balanced	600 Ohms
Unbalanced	100 Ohms
Digital	75 Ohms
Connectors:	
Balanced WECO	931-HSL/930-HFL
Unbalanced RCA	
Digital RCA	
S/PDIF Throughput:	44.1 & 48 ksps stereo (~6Mbaud)

General	
Temperature:	
Operating:	32F to 113F (0C to 45C)
Storage:	-4F to +140F (-20C to +60C)
Humidity:	10% to 90% non-condensing
MTBF:	20,000 hours
Shipping Weight:	4 pounds
Compliance:	FCC Class A, CE Emissions, Health and Safety and RoHS
Power:	
Input:	100 VAC to 240 VAC, 50/60 Hz, Non-Grounded, wall transformers
TCAT	12 VDC, 0.120 Amp
RCAT	12 VDC, 0.175 Amp
Power Supply Input Plug	2.1mm, Center Positive
Dimensions:	5.75” wide by 1.5” high by 2.25” deep

SECTION 2. INSTALLATION

2.1 INTRODUCTION

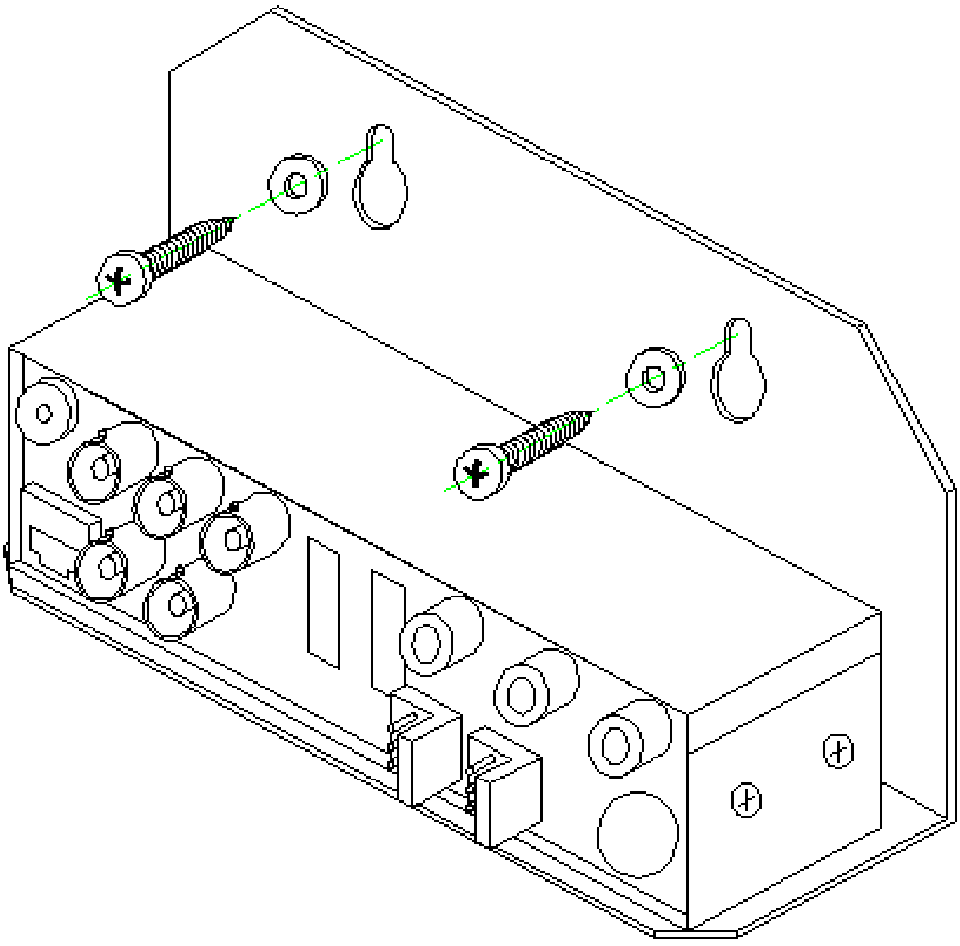
This section provides the information required for installation of the CAT Video Distribution System into its operating environment.

2.2 UNPACKING AND INSPECTION

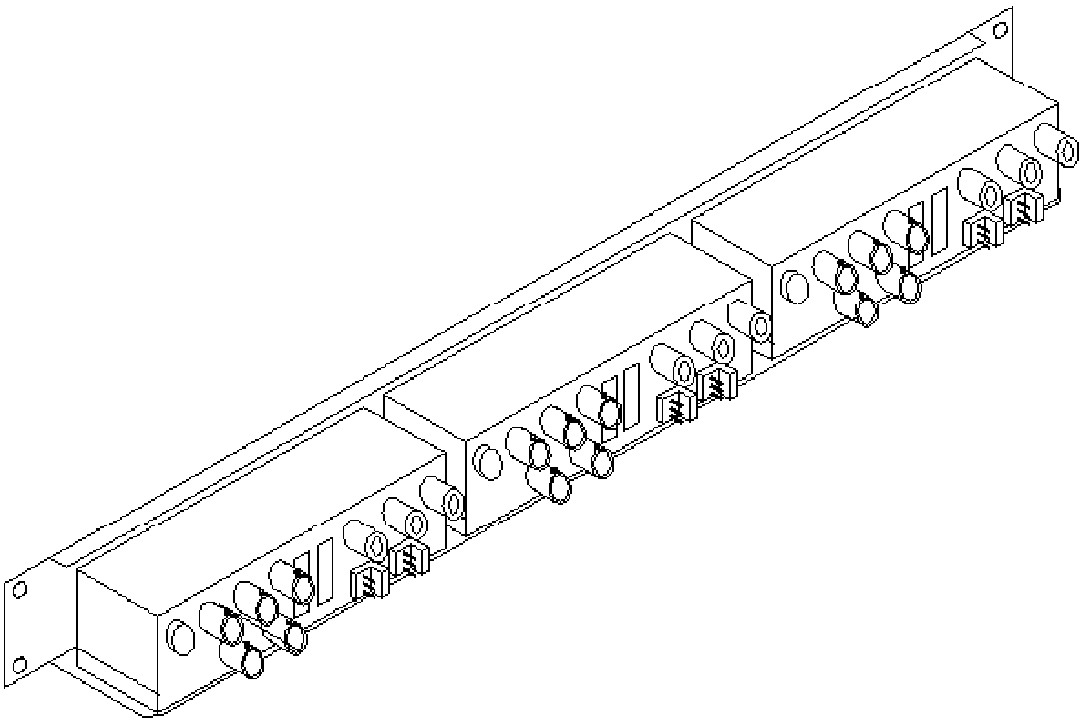
Unpack the CAT Video Distribution System carefully and verify that the serial number matches the number quoted on the packing list. Before installing it into a system, check the outside of the unit carefully for signs of damage and check that none of the fasteners has come loose.

2.3 INSTALLATION

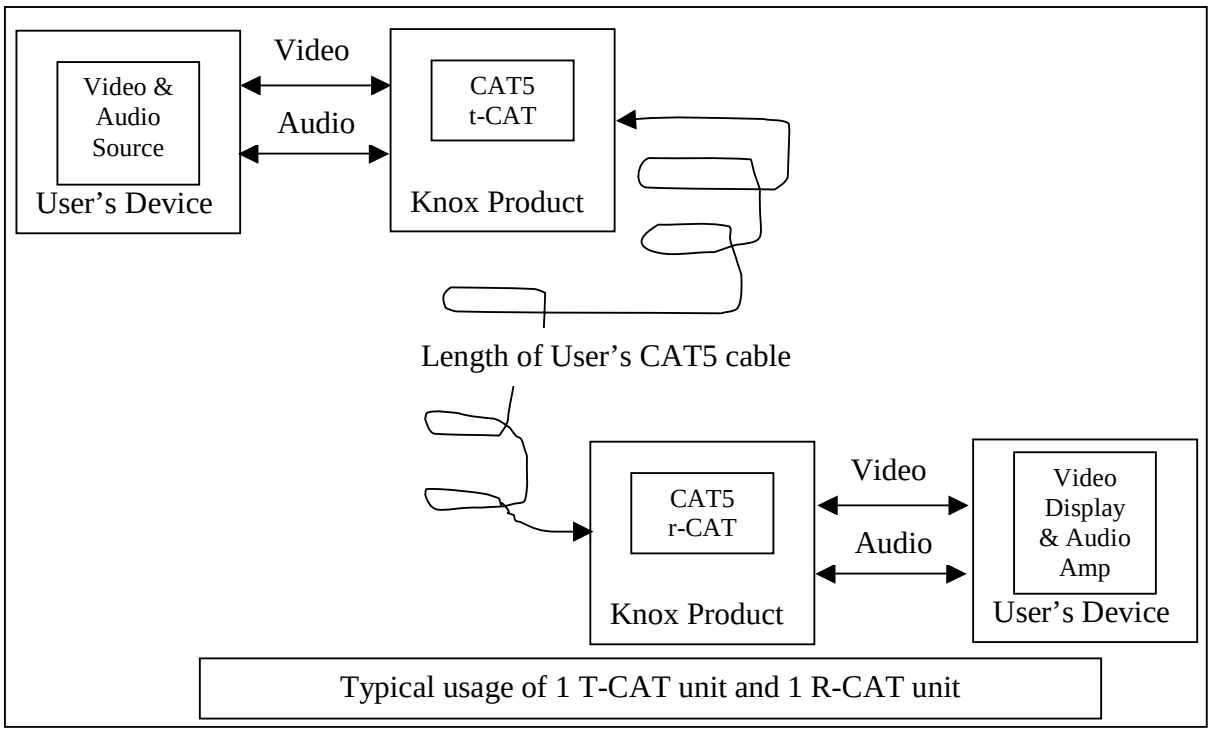
The CAT Video Distribution System has two mounting configurations available. There is a multi unit rack mounting bracket and a single unit wall bracket. Which one you use will depend on the location. Choose a space, which is convenient for all the cables to converge. Then make all Audio and Video connections prior to connecting the DC power plug.



SINGLE UNIT WALL MOUNT



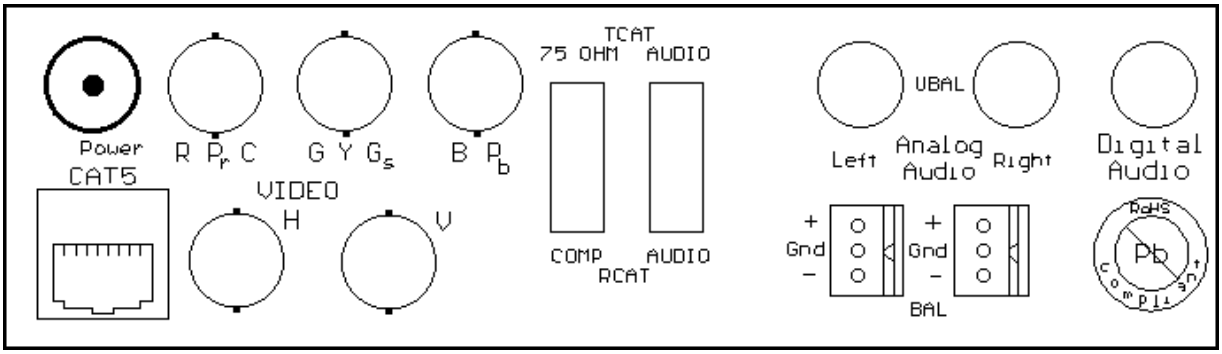
THREE UNIT RACK MOUNT



Connect the AC power transformer to a power mains outlet of the correct voltage and frequency then plug the DC power connector into the t-CAT or r-CAT. There is no power switch on the CAT Video Distribution System; it is intended to be on at all times.

2.4 VIDEO CONNECTIONS

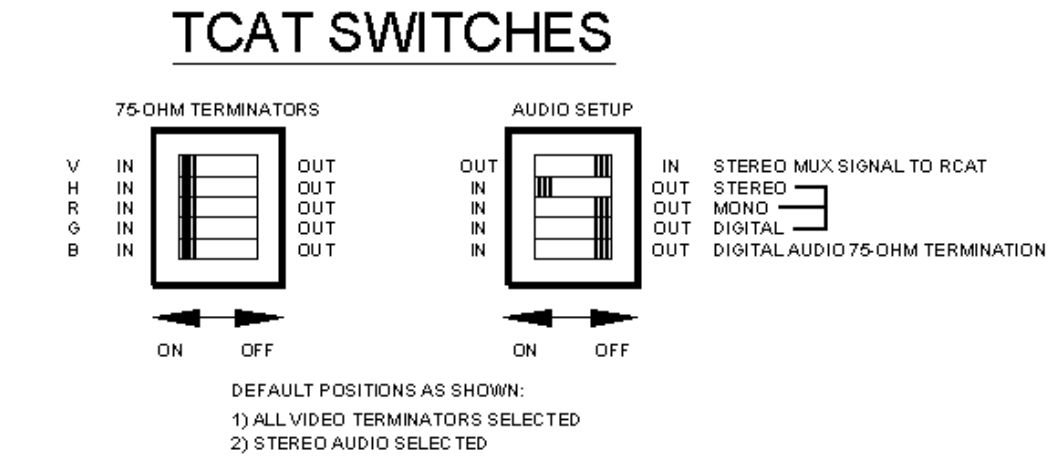
There are five BNC connectors for the video signal to accommodate the various video formats. Be sure that all devices are terminated in 75 ohms. It is not necessary to terminate unused inputs or outputs. If the incoming signal is already terminated be sure the 75-Ohm DIP Switch is set to off to prevent double termination. The first of the five connectors is for the Red signal in a RGBHV and RGB systems, Pr in a YPbPr system or C in a Y/C system. The second connector is for the Green, Gs or Y signal. The third connector is for the Blue or Pb signal. While the Horizontal and Vertical signals are applied to the fourth and fifth BNC connectors.

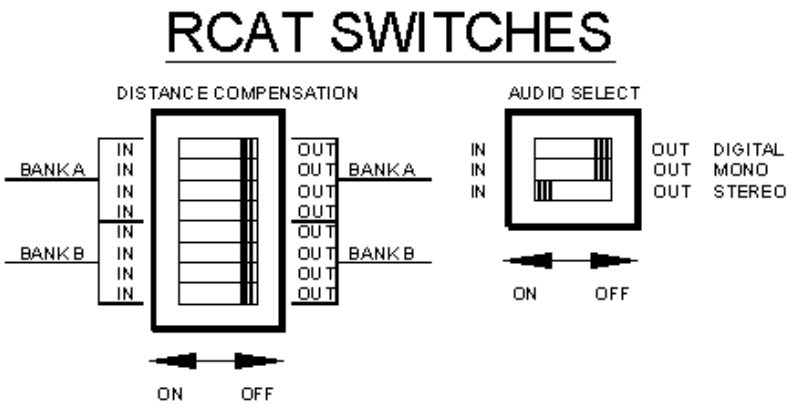


r-Cat and t-CAT Rear Panel Diagram.

2.5 AUDIO CONNECTIONS

The CAT Video Distribution System can transport balanced, unbalanced or digital S/PDIF audio sources but not simultaneously. Use the Audio DIP switch to select the desired format. The balanced audio connections are made via a pair of WECO three terminal screw connectors When using balanced audio, the common is at the center, the + is on top and – is on the bottom as shown on the figure. The unbalance audio and S/PDIF use RCA Connectors.





COMPENSATION TABLE		
DISTANCE	BANK A	BANK B
0 - 75 FT	OUT	OUT
75 - 225 FT	OUT	IN
225 - 375 FT	IN	OUT
375 - 525 FT	IN	IN

DEFAULT POSITIONS AS SHOWN:
1) NO COMPENSATION SELECTED
2) STEREO AUDIO SELECTED

2.6 CAT CONNECTIONS

Signal losses increase with transmission line length. The CAT Video Distribution System contains additional support to equalize video signals along longer twisted pair transmission lines. A full solution to accomplish this is built into the r-CAT. A combination of four DIP Switches in two banks supplies the necessary compensation to nullify the detritus effects of the cable. The r-CAT can be adjusted in four steps to handle cable lengths up to 450 feet,

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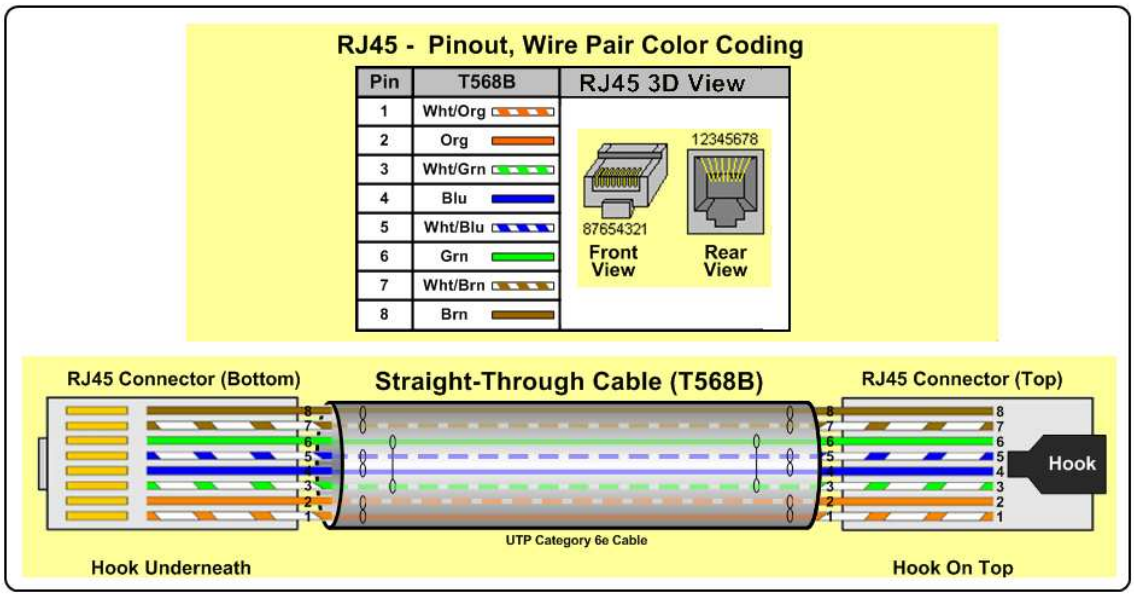

SECTION 3. TROUBLESHOOTING

In most cases, issues with the Knox CAT Video Distribution System can be resolved by checking the CAT5/5e/6 cable termination and ensuring it is pinned to the EIA T568B specification.

3.1 NO VIDEO SIGNAL AT THE r-CAT OUTPUT

Check that both units are powered.
Check the source and destination devices are powered and functioning.
Ensure the cable termination is pinned to the EIA T568B specification.
Check that the DIP switches are set properly.

3.2 POOR VIDEO QUALITY

Ensure the compensation DIP switches on the r-CAT is in the correct position
Check cable connections
Refresh rate of the signal may be set too high.

3.3 POOR AUDIO QUALITY

Amplified speakers are required. Ensure an amplifier drives the speakers.
Check input source levels from source device. Make sure the audio source is not over or under driven.

3.4 GREEN SHIFT/GREEN WASHOUT

The standard Knox product is designed to function with DC coupled signals with the black level referenced to 0 Volts. Nearly all VGA cards function this way. However, some media servers or digital camera devices provide AC coupled signals and can cause a green color shift in the video.

3.5 DELAY SKEW IN UTP CABLES

Knox has long recognized the skew issue of Unshielded Twisted Pair, UTP, cable. Skew describes timing differences where multiple cables deliver multiple signals that must arrive at the same time. Category 5/5e/6 cables are intentionally designed such that each one of the four twisted pairs of cable has a different twist. However, this difference in twist causes a variation in length of the conductors. This variance of twist is intentionally done to minimize crosstalk between the pairs. Because all four pairs work simultaneously, and each delivers a part of the signal, the timing or 'skew' of the pairs is also critical to system operation. Nano-skew cable maintains a consistent twist in between the inner pairs; this cable allows a minimal amount of skew delay keeping the timing consistent. The electrical lengths of the conductors are sufficiently equal to allow use for analog video networks without undue equalization. The CAT Video Distribution System was design to be used with standard Category 5/5e/6 cables of lengths of less than 500 feet. By using nano-skew cable that length can be doubled.

SECTION 4. MAINTENANCE

CAUTION! There are no user serviceable parts in the CAT Video Distribution System. Do not operate unit with top cover removed.

4.1 INTRODUCTION

The CAT Video Distribution System uses passive air flow (convection) to keep its power supply within a safe operating temperature range. No maintenance of the cooling system is required. No other routine maintenance is required in the CAT Video Distribution System.