BID ADDENDUM

PROJECT: Pinal County
San Tan Valley Complex
31505 A and B Schneef Rd.
San Tan Valley, AZ 852143

OWNER: Pinal County
31 N. Pinal St., Bldg. F
Florence, AZ 85132

BID ADDENDUM NO: 002
DATE: 12/04/19
AW PROJECT NO.: 18.077
OWNER PROJECT NO.: 192521

TO: Archie Carreon
Pinal County Facilities Manager
121 W. 22nd St.
Florence, AZ 85132
Telephone: (520) 866-6416

FROM: Arrington Watkins Architects
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Phoenix, Arizona 85016
Monika Barton, Project Manager
Telephone: (602) 279-4373

PROJECT NAME: Pinal County San Tan Valley Complex

PURPOSE: Clarifications to drawings.

DRAWINGS (w/ Description of revisions):

SHEET ARCHITECTURAL N-A-1.1
1) Note was altered to specifically reference Detail 117/ A-9.1.1 at the southwest corner of the North Building.

2) Interior elevations and details were added to plans to clarify construction and location of privacy screens. See details 223/A-9.2.2 and 233/A-9.2.2.
   b. N-A-2.4: Revised interior elevation numbers 4,7,10/N-A-6.3 to 11,17,20/N-A-6.3 and added detail callouts 222/A-9.2.2 and 538/A-9.5.2 to window WNC109A.
c. N-A-2.5: Added detail callouts 222/A-9.2.2 to window WND135A and 538/A-9.5.2 to window WND134B.

SHEET ARCHITECTURAL N-A-2.3

3) Copy/Fax Room number corrected from “NB000” to “NB108” located near grid lines 2 and F.
SHEET ARCHITECTURAL N-A-2.4
4) Interior Elevation 20/N-A-6.2 added in Conference Room ND128 near grid lines 5 and E for casework clarification.

SHEET ARCHITECTURAL N-A-2.5
5) Interior Elevation 10/N-A-6.3 added in Lobby ND137 near grid lines 6 and H-1 for casework clarification.

SHEET ARCHITECTURAL N-A-2.6
6) Interior Elevations 8,9/N-A-6.3 added in Secretary/Reception NE109 near grid lines 7 and E for casework clarification.
SHEET ARCHITECTURAL N-A-4.1

7) Building addressing (min. 12” high letters as required by the IBC). Numbers / letters shall be provided in two separate visible locations on each building. Lettering shall be metal letters, a min. 2” deep in black or dark anodized aluminum permanently affixed to the building(s). At a min. text shall read “31550 A” and “31550 B” for each building respectively.

a. For North Building A, building address will be located on the East Elevation, view #2, between gridlines 4 and 5 at top of wall and on the West Elevation, view #4, at grid line 1 at top of wall.
b. For South Building B, building address will be located on the East Elevation, view #2, at gridline 10 at top of wall and on the West Elevation, view #4, at grid line 10 at top of wall.

East Elevation 2/S-A-4.1

West Elevation 4/S-A-4.1
SHEET ARCHITECTURAL N-A-6.2 AND N-A-6.3

SHEET ARCHITECTURAL N-A-6.3

SHEET ARCHITECTURAL S-A-5.3

10) Hardware sets were corrected to match the door hardware specifications for the following doors: SA109A, SA116D, SA119A, SB108A, SB110A, SB110B, SC112A, SD101A, SD102A, SD106A, SD106B, SD111A, SD117B, SD130A, and SD132A. See attached sheet S-A-5.3. Automatic door operators were also added to doors SA101A and SB101A and is reflected in the schedule changes.

SHEET ARCHITECTURAL N-A-5.3

11) Automatic door operators were also added to doors NB101A, NC101A, ND101A, and NC101C and is reflected in the schedule changes.

SHEET ARCHITECTURAL A-9.2.2

12) Walls at transaction windows with deal trays have been adjusted from 3-5/8” metal stud walls to 8” metal studs to allow for the depth of the deal tray recessed into the counter. See detail 223/A-9.2.2.2.
**SHEET ARCHITECTURAL A-9.2.2**

13) Added detail 233/A-9.2.2 for deal tray at transaction window in CMU Wall.

**SHEET ARCHITECTURAL A-9.5.2**

14) Detail 538/A-9.5.2 Transaction Counter detail added to clarify counter construction and privacy screen.
SHEET ARCHITECTURAL A-9.5.1

15) Detail 520/A-9.5.1 Mail slot section added for clarification on construction of proposed mail slot.

SHEET ARCHITECTURAL A-9.5.1

16) Detail 502/A-9.5.1 CMU Bench detail added.
SHEET N-A-5.6
17) Room finish schedule has been updated to show correct epoxy finishes. The floor finish for rooms NA101, NA104, NA105, NA106, NA107, NA108, NA109, NA110, NA111, NA127, NC103, ND117 from EPXY-5 to EPXY-4. The following materials have been added to the Material Finish Legend: EPXY-4 floor finish, GYP-BD, and GYP-MR ceiling material as well as the colors for EPXY-1, EPXY-2, EPXY-3. Please see sheet N-A-5.6.

SHEET S-A-5.5
18) Room finish schedule has been updated to show correct epoxy finishes. The floor finish for rooms SD121 FROM EPXY-5 to EPXY-4. The following materials have been added to the Material Finish Legend: EPXY-4 floor finish, GYP-BD, and GYP-MR ceiling material as well as the colors for EPXY-1, EPXY-2, EPXY-3. Please see sheet S-A-5.5.

SHEET N-C5.1
19) Class of pipe for the culvers is noted in notes 45, 46, 47 & 48 shall all be Class IV RGRCP.

PROJECT MANUAL:

DIVISION 27 AND DIVISION 28 CHANGES

Add Division 27 specification “27 00 00 Communication Materials and Cabling”, dated 12/04/19.
· All MDF/IDF rooms shall be provided with (2) minimum equipment racks, ladder rack (50lf min.), and interconnecting fiber and Cat 6 cabling between rooms including interconnections between buildings.
· Note the scope of work indicated for complete systems including shop drawings, testing, cabling, devices, supports, etc. for Division 27 systems.
· Note fiber and Cat 6A specifications.
· Provide (2) data drops for each WAP location in lieu of one as indicated on symbol legend.

Add Division 28 specification “28 13 00 Access Control System”, dated 12/04/19.
· Reference the attached “Pinal County Acceptable Special System Div 27/28 Standard Equipment” cut sheets.
· Note the requirement to coordinate with Pinal County’s existing access control system and software.

Delete specification “28 16 00 Intrusion Detection” in total.
· Include in the construction scope of work to install rough-in conduit, outlet box, and pull string at each panic button location on plans for installation of devices and wiring by others.

Modify specification “28 23 00 Video Surveillance” as follows.
· Reference the attached “Pinal County Acceptable Special System Div 27/28 Standard Equipment” cut sheets.
· 1.1: Added requirements for Ocularis/OnSSI server. Coordinate specific requirements with the Owner.
1.1: Added Axis camera requirements.
2.5(B): Added Ocularis server requirements.

Refer to attached cut sheets provided by owner titled “Pinal County Acceptable Special System Division 27/28 Standard Equipment” which shall be made part of all Division 27 and Division 28 specifications and represent allowable products for those types of equipment and devices. Any deviation from those standard products shall be equal products that are approved by Pinal County in advance.

All Division 27 and 28 installers shall provide software licensing for two years from date of substantial completion except as coordinated with Owner in advance based on the Owner’s existing software licensing contracts in place.

All Division 27 and 28 installers shall be responsible for firestopping of all fire rated penetrations associated with their respective systems unless as provided by the GC.

Delete cameras in all areas except courtrooms. Include rough-in of conduit and outlet box at ALL camera locations (courtrooms and deleted locations) including Cat 6A cabling to ALL current and future locations indicated.

General: Provide each floor box with a 1” dedicated data conduit (not daisy chained).

ELECTRICAL DRAWINGS (w/ description of revisions):

North Building
General: Provide each floor box with a 1" dedicated data conduit (not daisy chained).
Drawing N-E2.0: Move drops in Sheriff’s Sergeant offices to match furniture layout.
Drawing N-E2.0: Add (2) drops for each desk / chair in patrol area NB127.
Drawing N-E2.1: Install (2) data drops at each floor box. ND129, ND128, NE106, ND138.
Note: Drawing revisions above are included, but not attached as part of this addenda.

South Building
General: Provide each floor box with a 1" dedicated data conduit (not daisy chained).
Drawing S-E2.0: Install (2) data drops at each desk/chair in SA107 area.
Drawing S-E2.0: Install (2) data drops at each floor box. SA108, SB110.
Drawing S-E2.0: Install (2) data drops at each floor box. SC113, SA116.
Note: Drawing revisions above are included, but not attached as part of this addenda.

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I. GENERAL

A. Purpose

1. The purpose of this document is to provide a standard defining the structured communications cabling systems to be installed within Pinal County facilities. It is geared toward leveraging our legacy cabling infrastructure while upgrading to more recent technologies in new installations. The goal is to accomplish this in the most economic and systematic fashion possible, and in a manner compliant with the latest codes, cabling standards and industry best practices.

2. Within this document, the facilities owner is Pinal County, and shall be referred to as such, or as “Pinal County”, or as “Information Technologies”. Bidding low-voltage installers shall be referred to as “Contractor”.

3. This specification defines quality standards and practices common to all Pinal County enterprise network cabling upgrades and Greenfield (new) projects.

4. In addition to this global cabling standard, individual projects will also have associated documentation such as Requests for Proposals (RFP), facility drawings, project schedules and requirements pertaining to that particular job. Such collateral will be referred to in this document as “Project-specific Documentation”, “Project Documentation”, or simply “Construction Documents”. Any conflict between this general specification and any project-specific documentation shall be brought to the attention of Pinal County and must be resolved in writing.

5. It is the responsibility of the installing contractor to evaluate these general recommendations and adapt them effectively to actual projects. Contractor is responsible for identifying and bringing to the attention of Pinal County any design directions that may be improved. All such changes shall be approved in writing from Information Technologies.

6. Note that while many portions of this global specification are addressed to “The Contractor”, these requirements apply equally to anyone doing the network cabling and infrastructure work within Pinal County, whether those persons are outside contractors or persons directly employed by Information Technologies.

B. Scope of Work

1. Contractor shall be solely responsible for all parts, labor, testing, documentation and all other associated processes and physical apparatus necessary to turn over the completed system fully warranted and operational for acceptance by Pinal County including, but not limited to,

   a. Station cabling from MDF/IDF rooms to outlet devices.

   b. Backbone fiber and cabling between all MDF and IDF rooms and between all buildings. Fiber shall be single mode.
c. Termination blocks, patch panels, patch cords, equipment racks, and all else to complete cabling and hardware installations.

d. Installation of raceways, boxes, terminations, and all else to accommodate incoming telephone / communication utilities as coordinated with Owner’s IT representative and communication utilities.

e. Installation of all cable supports including J-hooks, basket tray, cable tray, ladder rack, conduits, and boxes.

f. Grounding and bonding of all raceways, trays, equipment panels, racks, ground busses, and where required by Division 26 and NEC Art. 250.

g. Termination of all cabling.

h. Preparation of shop drawings complete with device, cable, tray locations.

i. Submittal of test reports for owner’s review and approval.

j. Preparation of as-built drawings for owner’s review and approval.

k. Firestopping of all raceways and cables to meet structure fire ratings as outlined in architectural plans.

2. This specification includes structured cabling design considerations, product specifications and installation guidelines for low-voltage network systems and associated infrastructure including, but not limited to:

   a. Cabling Sub-system 1 – Horizontal Copper
   b. Cabling Sub-system 2 - Intrabuilding Fiber Backbone Cabling
   c. Cabling Sub-system 3 – Interbuilding Fiber Backbone Cabling
   d. Telecommunications Pathways
   e. Communications Racks and Cable Managers
   f. Communications Grounding Systems
   g. Cabling Labeling and Administration

3. In addition to systems specifications, this document also addresses applicable codes and standards, contractor qualifications and requirements, system warranties and system testing and acceptance.

4. Products to be used in Pinal County telecommunications infrastructure projects are listed in “Appendix A” and cut sheets at the end of this document.

5. Submittals

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a. The Installing contractor shall include in the scope of work a meeting with owner’s IT representative to review proposed system design, materials, software, and hardware requirements prior to preparation of final shop drawings for Owner’s review and approval.

b. Contractor shall submit a complete set of plans (36” x 24”) in PDF format and hard copy of each system for Owner’s review and approval. Plans shall include bill of materials and cut sheets for all proposed equipment and materials consistent with this specification or equals approved in advance by Pinal County, plan drawings, wiring diagrams, calculations, and details.

C. Applicable Regulatory References

1. Contractor is responsible for knowledge and application of current versions of all applicable standards and codes. In cases where listed standards and codes have been updated, Contractor shall adhere to the most recent revisions, including all relevant changes or addenda at the time of installation.

2. ANSI/TIA:


   c. ANSI/TIA-4994 (March 2015) Standard for Sustainable Information Communications Technology

   d. ANSI/TIA-526-14-C (April 2015) Optical Power Loss Measurements of Installed Multimode Fiber Cable Plant

   e. ANSI/TIA-568.0-D (September 2015) Generic Telecommunications Cabling for Customer Premises (supersedes TIA-568-C.0 and TIA-568-C-1)

   f. ANSI/TIA-568.2-D (September 2018) Balance Twisted Pair Communications and Components Standards

   g. ANSI/TIA-568.1-D (September 2015) Commercial Building Telecommunications Infrastructure Standard (supersedes ANSI/TIA-C.1)

   h. ANSI/TIA-569-D (April 2015) Telecommunications Pathways and Spaces

   i. ANSI/TIA-598-D (July 2014) Optical Fiber Cable Color Coding

   j. ANSI/TIA-570-C (August 2012) Residential Telecommunications Infrastructure Standard

   k. ANSI/TIA-606-C (June 2017) Administration Standard for Telecommunications Infrastructure
l. ANSI/TIA-607-C (November 2015) Generic Telecommunications Bonding and Grounding (Earthing) for Customer Premises

m. ANSI/TIA-758-B (March 2012) Customer-Owned Outside Plant Telecommunication Infrastructure Standard

n. ANSI/TIA-862-B (February 2016) Structured Cabling Infrastructure Standard for Intelligent Building Systems

o. ANSI/TIA-942-B (July 2017) Telecommunications Infrastructure Standard for Data Centers

p. ANSI/TIA-1005-A (May 2012) Telecommunications Infrastructure Standard for Industrial Premises


r. ANSI/TIA-1183 (August 2012) Measurement Methods and Test Fixtures for Balun-Less Measurements of Balanced Components and Systems


t. TIA-1152 (November 2016) Requirements for Field Test Instruments and Measurements for Balanced Twisted-Pair Cabling

u. TIA-1179-A (September 2017) Healthcare Facility Telecommunications Infrastructure Standard

v. ANSI/TIA-4966 (May 2014) Telecommunications Infrastructure Standard for Educational Facilities

w. TIA-455-104-B (February 2016) FOTP 104- Fiber Optic Cable Cyclic Flexing Test (supersedes TIA-455-104-A)

x. TIA/EIA-455-25-D (February 2016) FOTP-25 Impact Testing of Optical Fiber Cables

y. TIA-604-18 (November 2015) FOCIS 18 Fiber Optic Connector Intermateability Standard – Type MPO-16

z. TIA-604-5-E (November 2015) FOCIS 5 Fiber Optic Connector Intermateability Standard- Type MPO

aa. TIA-5017 (March 2016) Telecommunications Physical Network Security Standard

bb. TIA-TSB-155-A (Reaffirmed 10-6-2014) Guidelines for the Assessment and Mitigation of Installed Category 6 Cabling to Support 10GBASE-T


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ee. TSB-4979 (August 2013) Practical Considerations for Implementation of Multimode Launch Conditions in the Field

ff. TSB-190 (June 2011) Guidelines on Shared Pathways and Shared Sheaths


hh. TSB-5018 (July 2016) Structured Cabling Infrastructure Guidelines to support Distributed Antenna Systems

ii. TIA-492AAAE (June 2016) Detail Specification for 50-µm Core Diameter/125-µm Cladding Diameter Class 1a Graded-Index Multimode Optical Fibers with Laser-Optimized Bandwidth Characteristics Specified for Wavelength Division Multiplexing

jj. TIA-492AAAB-A (November 2009) Detail specification for 50-µm core diameter/125-µm cladding diameter class 1a graded-index multimode optical fibers


ll. TSB-172-A (February 2013) Higher Data Rate Multimode Fiber Transmission Techniques

3. ISO/IEC


   b. ISO/IEC 24702 Edition 1.0: Information Technology – Generic Cabling – Industrial Premises

   c. ISO/IEC 24764 Edition 1.0: Information Technology – Generic Cabling Systems For Data Centres


4. National Electric Codes


   b. ANSI/NFPA 70-2011, National Electrical Code© (NEC©)


   d. National Electrical Code (NEC) (NFPA 70)

5. OSHA Standards and Regulations – all applicable

6. Local Codes and Standards – all applicable

7. BICSI – Building Industry Consultative Services International
b. ANSI/BICSI 005-2013, Electronic Safety and Security (ESS) System Design and Implementation Best Practices
d. ANSI/BICSI 002-2011, Data Center Design and Implementation Best Practices
e. Network Systems and Commissioning (NSC) reference, 1st Edition
f. ANSI/NECA/BICSI 568-2006, Standard for Installing Commercial Building Telecommunications Cabling
g. NECA/BICSI 607-2011, Standard for Telecommunications Bonding and Grounding Planning and Installation Methods for Commercial Buildings
h. AV Design Reference Manual, 1st Edition
m. Commercial Installation On-the-Job Training Booklet
a. Telecommunications Project Management (TPM) reference, 1st Edition

8. Anywhere cabling standards conflict with electrical or safety codes, Contractor shall defer to the NEC and any applicable local codes or ordinances, or default to the most stringent requirements listed by either.

9. Knowledge and execution of applicable standards and codes is the sole responsibility of the Contractor.

10. Any violations of applicable standards or codes committed by the Contractor shall be remedied at the Contractor’s expense.

D. Substitution Policy

1. This is a performance-based specification based on the experience of Pinal County in providing exceptional solutions for all of our facilities and departments. As such, substitution of specified systems is discouraged, but allowed if Contractor strictly follows the Pinal County Substitution Policy outlined below.

2. Contractors offering product substitutions or equivalents are responsible for proving equal or superior mechanical and transmission performance to those products listed herein.

3. The process for substituting products other than those specified is as follows:
a. Any Contractor wishing to offer structured cabling or associated infrastructure products other than those specified shall submit a request for product substitution in writing no less than one week in advance of bid.

b. Written requests for substitution shall be accompanied by three samples of the substitution product along with associated drawings, specification sheets and engineering documents for evaluation by Pinal County.

c. Any copper or fiber cabling products that carry signal shall be accompanied by third party laboratory performance test reports from an ITS/ETL, proving equivalency in transmission performance.

d. Performance tests from the manufacturer of the product will not be accepted. Tests other than channel link will not be accepted.

e. Equal product acceptance must be received from Pinal County in writing to be valid.

f. Contractor shall assume all costs for removal and replacement of any substituted product installed without prior written approval. Such costs shall include but not be limited to labor, materials as well as any penalties, fees or costs incurred for late completion.

E. Contractor Qualifications

1. General

a. Contractor shall be a current Panduit ONE℠ Partner, Silver or above only, that has completed the Structured Cabling Deployment Training (Panduit Certified Installer). A copy of the corporate Panduit manufacturer certification shall be included with all quotes.

b. Contractor must have at least 5 years documented experience installing and testing structured cabling systems of similar type and size.

c. Contractor shall have offices and service personnel based with a fifty-mile radius of Pinal County and be capable of same-day response to service calls.

d. Contractor shall employ at least one BICSI Registered Communication Distribution Designer (RCDD) to sign-off on all designs offered, including stamping the design with their current BICSI/RCDD stamp.

e. Contractor shall have the responsibility to obtain any of the necessary permits, licenses, and inspections required for the performance of data, voice, and fiber optic cable installations.

f. At least 30 percent of the technicians on the job must have a current Panduit Certified Copper Technicians certificate, or accepted substitute manufacturer, to install copper distribution systems.

g. At least 30 percent of the technicians installing any Fiber Distribution Systems must have a current Panduit Certified Fiber Technicians certificate, or accepted substitute manufacturer certificate, to install fiber distribution systems.

h. The Telecommunications contractor must provide a project manager to serve as the single point of contact to manage the installation, speak for the contractor and provide the following functions:
   - Initiate and coordinate tasks with the Pinal County Project Manager and others as specified by
the project schedule.

- Provide day to day direction and-site supervision of Contractor personnel.
- Ensure conformance with all contract and warranty provisions.
- Participate in weekly site project meetings.
- This individual will remain project manager for the duration of the project. The contractor may change Project Manager only with the written approval of Pinal County.

i. Contractor Project manager must be manufacturer certified in the copper and fiber information transport systems to be installed.

2. References

a. Communications Contractor shall provide with bid, a list of three reference accounts where similar Data, Voice, Fiber Optic Cable, and related equipment installation work was performed within the last year (twelve-month period).

3. Termination of Services

a. Pinal County reserves the right to terminate the Communication Contractor’s services if at any time the Pinal County Engineer determines the Communication Contractor is not fulfilling their responsibilities as defined within this document.

b. Contractor’s appearance and work ethics shall be of a professional manner, dress shall be commensurate with work being performed.

c. Dress displaying lewd or controversial innuendos will strictly be prohibited.

d. Conduct on Pinal County property will be professional in nature.

b. Any person in the Contractor’s employ working on a Pinal County project considered by Pinal County to be incompetent or disorderly, or for any other reason unsatisfactory or undesirable to the Information Technologies, such person shall be removed from work on the Pinal County project.

c. Upon termination, the Communications Contractor shall be restricted from the premises and compensated for the percentage of work completed satisfactorily.

4. Other Contractor Responsibilities

a. Confirmation of Pathway and Cable Manager Sizing:

- Wherever cabling pathways or managers are installed, it is the Contractor’s responsibility to confirm pathway or manager sizing to represent no more than 30% fill according to manufacturer’s fill charts based on projected cable densities when racking systems and cabling pathways are fully populated.

- Pathways overfilled upon installation will not be accepted and shall be remedied at Contractor expense.
b. Contractor is responsible for the removal and disposal of all installation and construction debris created in the process of the job. All work areas will be cleaned at the conclusion of the workday and no tools or materials shall be left in a manner as to pose a safety hazard.

c. Contractor must remove all abandoned cable per Article 800 of the National Electrical Code and per TIA and BICSI standards, recycling these materials where possible. Removal of orphaned cable is mandatory. Contractors must consider this when placing bids.

d. Contractor shall abide by the regulations set by local Pinal County’s Security Policy pertaining to access and conduct while on Pinal County property.

e. Contractor shall all obey all posted speed limits and parking regulations at the Pinal County facilities where the work is being performed.

F. Warranty

1. General

a. Contractor shall provide a 25 year Panduit Certification PLUS™ System Warranty (or Pinal County approved equal) on all copper and fiber permanent cabling links.

b. It is understood the Certification PLUS™ Warranty is a system performance warranty guaranteeing for 25 years from acceptance that the installed system shall support all data link protocols for which that Category of copper cabling system or fiber OM/OS designation of fiber optic system is engineered to support according to current and future IEEE and TIA standards.

c. The Certification PLUS™ System Warranty may be invoked only if the cabling channel links are comprised of continuous Panduit/General Cable components, including patch cords, equipment cords and fiber jumpers.

d. Upon acceptance of Warranty, Panduit will mail a notification letter to the installer and a notification letter and warranty certificate to Pinal County.

2. Contractor Warranty Obligations

a. Installation firm (Contractor) must be a current Panduit Certified Installer (PCI) or approved equivalent manufacturer in good standing and shall include a copy of the company installation certification with the bid.

b. Contractor shall name a supervisor to serve on site as a liaison responsible to inspect and assure all terminations are compliant to factory methods taught in Panduit Technician Certification Training, or approved equal, and according to all Standards cited in the Regulatory References section of this document.

c. Contractor liaison (project supervisor) shall have a current, up-to-date Panduit Certified Technician (PCT) certificate in both copper and fiber. Copies of the copper and fiber certificates of the Panduit liaison shall be submitted with the bid. These requirements are the same for accepted equivalent manufacturers. See “Substitution Policy” for mandatory procedure when offering substitutions.

d. Fiber optic cabling system additions and upgrade to existing facilities (Brownfield) shall match the fiber...
type (OM/OS designation) of the system to which it is being installed. Contractor shall under no circumstances mix different OM/OS classes of cable or termination devices (connectors) within the same system.

e. All intrabuilding new fiber optic installations shall utilize an appropriate construction of OM3/OM4 or OS1/OS2 fiber as specified herein.

f. All UTP cable pulled and terminated shall be Category 6/6A cable and connectivity whether new or legacy systems.

g. All UTP terminations within the Pinal County Greenfield (new) projects shall be terminated using the T568B pin-out (wire map). Legacy additions shall match the copper pin-out of the facility to which cabling is being added-to or upgraded.

h. Contractor shall install all racking and support structures according to cited Standards in such fashion as to maintain both cited industry standards as well as manufacturer recommendations for uniform support, protection, and segregation of different cable types,

i. Contractor is responsible for maintenance of maximum pulling tensions, minimum bend radius, and approved termination methods as well as adhering to industry accepted practices of good workmanship.

j. Contractor is responsible for understanding and submitting to Panduit all documents required prior to project start to apply for the Panduit Certification PLUS warranty. These include but are not limited to the project information form and SCS warranty agreement. These requirements are the same for accepted equivalent manufacturers. See “Substitution Policy” for mandatory procedure when offering substitutions.

k. Contractor is responsible for understanding and submitting to Panduit all documents required at project end. These include, but are not limited to: completed warranty forms, passing test reports and drawings of floor plans showing locations of links tested. These requirements are the same for accepted equivalent manufacturers. See “Substitution Policy” for mandatory procedure when offering substitutions.

l. Test results shall be delivered in the tester native format (not Excel) and represent the full test report, summaries shall not be accepted. Contact your Panduit representative for a current list of approved testers, test leads and latest operating systems.

m. The Communications Contractor will correct any problems and malfunctions that are warranty-related issues without additional charge to Pinal County for the entire warranty period.

n. The warranty period shall commence following the final acceptance of the project by Pinal County and written confirmation of Warranty from Panduit. These requirements are the same for accepted equivalent manufacturers. See “Substitution Policy” for mandatory procedure when offering substitutions.

<END OF SECTION>
II. Installation and Maintenance Guidelines

A. Maintenance of Patch Fields

1. Any persons, whether with a Contractor or Pinal County, adding or moving copper or fiber optic patch (equipment) cords shall do so in a neat, workmanlike fashion in keeping with the original system cable management design concept and according to all industry best practices as outlined in cabling standards and applicable BICSI publications referenced in this document.

2. Persons performing such moves, adds or changes (MACs) shall further adhere to the following:
   a. Use existing cabling management pathways and take care to place cable like with like, maintaining original segregation strategies for separating fiber and copper cables as well as any separation necessary between different types of copper cables.
   b. Cables shall be dressed neatly within patch management pathways with care taken to maintain minimum bend radius of not less than 1 times the cord outer diameter for copper and not less than a 1” bend radius for fiber jumpers as per ANSI/TIA 568-C.0.
   c. All patch cords used shall be of same Copper Category or Fiber OM/OS designation as the media used in the permanent cabling links.
   d. Patching in all cases shall be done using factory terminated cords manufactured for that purpose. Hand terminated patch cords will not be accepted.
   e. All patch cords or jumpers must be completely contained within supplied cable management paths. Cables draped across the front cabinets or racks will not be accepted and shall be remedied at Contractor's expense.
   f. Any persons installing or moving fiber optic patch cords for any reason will clean the connector with lint-free wipes and 99% or higher isopropyl alcohol before replacing the connector in a patch or equipment port.
   g. Any technicians, whether with Pinal County or Contractors performing moves, adds or changes within patch field will label additions to the system according to the labeling conventions in place at that facility.
   h. Any persons with Pinal County or installing Contractor performing moves, adds or changes within patch field will record the move according to record system in place at that facility.

B. Cable Pulling and Termination

1. General
   a. Contractor is responsible for installing systems according to all applicable codes and the standards cited in this document.
   b. Contractor shall use grommets to protect the cable when passing through metal studs or any openings that can possibly cause damage to the cable. This includes grommets on ends of hard conduit where used.
c. Do not deform the jacket of the cable. The jacket shall be continuous, free from pinholes, splits, blisters, burn holes or other imperfections.
d. Install proper cable supports, spaced less than 5 feet apart, and within manufacturer's requirements for fill ratio and load ratings.
e. Leave a pull string to the end of each conduit run. Replace pull string if it was used for a cable pull.
f. Note service loops may not touch the drop-ceiling assembly. Any portion of the communications cabling making contact with ceiling structures must be remedied at the Contractor expense.
g. Label every cable within 12 in. of the ends with self-laminating wire wrap cable appropriate to that cable size. Use a unique number for each cable segment as required by the project documentation and the labeling section of this document.
h. Dress the cables neatly with hook and loop cable ties in telecommunications rooms. Plastic ties are approved in pathways where cable bundles will not be reentered. Contractor responsible for using plenum ties and appliances in air-return (plenum) spaces as required by the local AHJ (Authority Having Jurisdiction).
i. Contractors installing cabling systems in Pinal County facilities shall install plenum rated cable in all instances. Non-plenum cable is not allowed and shall be removed at Contractor's expense.

1. Copper
   
a. When making additions to legacy systems, Contractor shall match the cabling configuration (pinout) of the existing systems. Legacy systems at Pinal County are in most cases T568B.
b. Within all new (Greenfield) installations within Pinal County facilities, contractor shall use copper pinout T568B.
c. All four pair Category 6/6A cable runs shall be kept to a maximum permanent link length of 83 meters when using a total 10 meters of 28 awg "small diameter" patch cords.
d. Copper links that are 90 meters in permanent link, shall not exceed 6 meters (total) of patch cords when using 28 awg "small diameter" patch cords.
e. Use low to moderate force when pulling cable. Maximum tensile load may not exceed 25' lbs. maximum pulling force per 4 pair cable.
f. No pathway, including conduits shall have greater than a 35% fill per manufacturer fill charts. Contractor is responsible for bringing to the attention of Pinal County project manager any insufficiently sized conduit or cable pathways in project documentation.
g. Keep Category 6/6A cables as far away from potential sources of EMI (electrical cables, transformers, light fixtures, etc.) as required in cited TIA Standards.
h. All copper horizontal cabling shall have slack service loops no less than 12" at the work area (equipment outlet) and not less than 3 feet in the telecommunications room.
i. Slack at the work area may be stored in the ceiling or in the wall space. Service loops in the telecommunications room may be wall mounted or contained in pathways or racking systems if done in a
neat, workmanlike fashion.

j. Service loops shall be stored in such fashion as to not violate bend radius, slack touching the drop ceiling is not allowed and must be remedied at Contractor expense.

k. Maintain the twists of the pairs all the way to the point of termination, or no more than 0.5" (one half inch) untwisted.

l. All UTP patching shall be accomplished using Category 6/6A rated modular patch panels as indicated elsewhere in this document.

m. All removed copper cable is to be disposed of in a Pinal County recycling bin designated for "copper", or removed from the property to be disposed of by Contractor if this is the instructions in the project documentation.

2. Fiber

a. When making additions to legacy systems, Contractor shall match the fiber type and fiber connectors used within that system.

b. Within all new (Greenfield) fiber installations within Pinal County, contactor shall use Panduit OptiCam LC connectors as specified in the fiber section of this document.

c. When installing fiber cable, Contractor shall maintain a minimum bend radius, both under pulling load and static (installed), per requirements outlined within TIA standards, or manufacturer’s recommendations, whichever is the most stringent.

d. Fiber terminations shall be done according to recommendations of TIA, manufacturer’s requirements and accepted industry best practices.

e. All unjacketed fiber shall be contained within appropriate fiber enclosures. Exposed tight-buffered or loose-tube strands will not be tolerated and shall be remedied at Contractor’s expense.

f. Contractor shall use fusion splices when terminating loose-tube fiber in legacy installations. New installations shall use indoor/outdoor tight-buffered fiber constructions.

g. Contractor shall perform test setup and testing according to guidelines in the “Testing and Acceptance” section of this document.

<END OF SECTION>
III. Cabling Systems and Associated Infrastructure

A. Cabling Subsystem I – Horizontal Cabling System

1. Slack (Service Loops) in Horizontal UTP Cable

   a. Horizontal cable in Pinal County facilities is routed through conduit, but electrical boxes are not used for low-voltage communications cable.

   b. Contractor shall use low-voltage mounting brackets (“box-eliminators”) for mounting low-voltage communications faceplates.

   c. Contractor shall provide a minimum 12” slack or service loop at the equipment outlet (work area) on each terminated copper horizontal permanent link. Work area slack shall be contained within the wall behind the faceplate if this may be done easily without violating cable bend radius.

   a. Where there is not sufficient space behind the faceplate, Contractor may pull work area slack into the ceiling space and properly store service loop with appropriately rated hook and loop cable ties. Cable slack shall in no instances touch the ceiling grid or associated drop ceiling components or fixtures.

   b. Contractor shall provide a minimum of 10 feet slack or service loop in the horizontal telecommunications room on each terminated copper horizontal permanent link, to be stored on the wall backboard using appropriate mounting fixtures built to that purpose (i.e. D-rings).

   c. Contractor should consult project-specific documentation or the Pinal County project liaison for other mounting methods where wall mount is not an option.

2. Metal Conduit

   a. Cable in horizontal runs in classrooms shall be routed and contained in metal conduit.

   b. Contractor shall size conduit large enough to accommodate at least 50% growth, i.e. conduit for 4 cables shall be sized to accommodate 6 cables, etc.

3. Equipment Outlets (Faceplates)

   a. When adding horizontal cabling to existing facilities (Brownfield) within Pinal County, Contractor shall match the existing cable plant regarding color of existing raceway and faceplates.

   b. Flush mount faceplates in new projects (Greenfield) shall be Mini-Com® Classic Series Faceplates with Label and Label Cover or Pinal County approved equivalent.

   c. Faceplates shall be form-molded plastic, single-gang, International White (eggshell) in color and available in 2, 3, 4 and 6 hole versions. Faceplates shall further have the following characteristics:

      • Accept Mini-Com ® Modules for STP and UTP, fiber optic, and audio/video, which snap in and out for easy moves, adds, and changes.

      • Include label/label covers for easy port identification.

      • Have available replacement label/label covers.
d. Contractor shall use blank inserts to reserve space on any unused positions (holes) in faceplates.
e. See appendix A for part numbers.

4. Equipment Outlets – Surface Boxes

a. Wireless Access Points (WAPs) mounted on walls and ceilings utilize (2) Category 6A horizontal runs (drops) terminated in a 2 port white Mini-Com® Surface Mount.
b. Two hole boxes shall further meet the following requirements:
   - Accept Mini-Com ® Modules for STP and UTP, fiber optic, and audio/video, which snap in and out for easy moves, adds, and changes.
   - Mount easily with supplied mounting screws, adhesive tape, or optional magnet (CBM-X).
   - Cable entry from side and rear knockouts and from opening in center of base.
   - CBXJ2 and CBX2 include built-in removable blank to add a second module.
   - Optional adhesive labels available.

5. Copper Jacks – All Work Areas Category 6

a. Copper jacks shall be Mini-Com® TX6™ PLUS UTP Jack Modules or Pinal County approved equivalent.

b. Category 6 jacks at the work area shall be color white to match the faceplate.

c. Jacks used to populate angled modular panels shall be black.

d. Category 6 jacks shall further meet the following requirements:
   - Exceed ANSI/TIA-568-C.2 Category 6 and ISO 11801 2nd Edition Class E standards
   - Meet requirements of IEEE 802.3af and IEEE 802.3at for PoE applications
   - Be 100% tested to ensure NEXT and RL performance and be individually serialized for traceability.
   - Color-coded, keyed jack modules mechanically and visually distinguish connections to prevent unintentional mating with unlike keyed or non-keyed modular plugs accommodating more discrete networks.
   - Utilize patent-pending enhanced Giga-TX ™Technology for jack terminations which optimizes performance by maintaining cable pair geometry and eliminating conductor untwist.
   - Rated for 2500 cycles with IEEE 802.3af / 802.3 at and proposed 802.3bt type 3 and type 4
   - Have contacts plated with 50 micro inches of gold for superior performance.
• Require no punch down tool required; termination tool (EGJT) ensures conductors are fully terminated by utilizing a smooth forward motion without impact on critical internal components for maximum reliability.

• Have available a high-volume “gun-style” optional termination tool (TGJT) that reduces termination time by 25% and is ideal for high volume installations.

• Have guaranteed ability to be re-terminated a minimum of twenty times without measurable degradation of performance.

• Employ a white termination cap to designate Category 6 performance at a glance and provides positive strain relief; help control cable bend radius and securely retain terminated cable.

• Have range to terminate 4-pair, 22 – 26 AWG, 100 ohm, solid or stranded twisted pair cable.

• Utilize a universal termination cap is color-coded for T568A and T568B wiring schemes for flexibility across installations.

• Accept 6 and 8-position modular plugs without damage to conductor pins.

• Identified options that include optional labels and icons.

• Be compatible with Mini-Com® Modular Patch Panels, Faceplates, and Surface Mount Boxes.

• Have available optional RJ45 blockout device that blocks out unauthorized access to jack modules and potentially harmful foreign objects, saving time and money associated with data security breaches, network downtime, repair, and hardware replacement

• Have an optional dust cap keeps out dust and debris while not in use.

e. See Appendix A at the end of this document for part numbers.

6. Copper Jacks - Wireless Access Points (WAPs) Category 6A

a. Copper jacks shall be Mini-Com® TX6A™ PLUS UTP Jack Modules or Pinal County approved equivalent.

b. Category 6A jacks at the WAP area shall be color white to match the 2 port surface box.

c. Jacks used to populate angled modular panels shall be black.

d. Category 6A jacks shall further meet the following requirements:

- Exceed ANSI/TIA-568-C.2 Category 6A and ISO 11801 Class EA standards
- Meet requirements of IEEE 802.3af and IEEE 802.3at for PoE applications
- Be 100% tested to ensure NEXT and RL performance and be individually serialized for traceability.
- Color-coded, keyed jack modules mechanically and visually distinguish connections to prevent
unintentional mating with unlike keyed or non-keyed modular plugs accommodating more discrete networks.

- Include MaTriX split foil tape to suppress the effects of alien crosstalk, allowing 10 Gb/s transmission even in high density 48-port, 1RU patch panels.
- Utilize patent-pending enhanced Giga-TX ™Technology for jack terminations which optimizes performance by maintaining cable pair geometry and eliminating conductor untwist.
- 2500 Rated for 2500 cycles with IEEE 802.3af / 802.3at and proposed 802.3bt type 3 and type 4
- Require no punch down tool required; termination tool (EGJT) ensures conductors are fully terminated by utilizing a smooth forward motion without impact on critical internal components for maximum reliability.
- Have available a high-volume “gun-style” optional termination tool (TGJT) that reduces termination time by 25% and is ideal for high volume installations.
- Have guaranteed ability to be re-terminated a minimum of twenty times without measurable degradation of performance.
- Employ a blue termination cap to designate Category 6A performance at a glance and provides positive strain relief; help control cable bend radius and securely retain terminated cable.
- Have range to terminate 4-pair, 22 – 26 AWG, 100 ohm, solid or stranded twisted pair cable.
- Utilize a universal termination cap is color-coded for T568A and T568B wiring schemes for flexibility across installations.
- Accept 6 and 8-position modular plugs without damage to conductor pins.
- Identified options that include optional labels and icons.
- Be compatible with Mini-Com ® Modular Patch Panels, Faceplates, and Surface Mount Boxes.
- Have available optional RJ45 blockout device that blocks out unauthorized access to jack modules and potentially harmful foreign objects, saving time and money associated with data security breaches, network downtime, repair, and hardware replacement.
- Have an optional dust cap keeps out dust and debris while not in use.

- See Appendix A at the end of this document for part numbers.

7. Category 6A Unshielded Twisted Pair Cable – All Work Areas

a. Inside 4 pair horizontal cable for Pinal County facilities shall be white jacketed plenum rated GenSPEED® 10 MTP™ Category 6A UTP Copper Cable with Mosaic Crossblock™ Technology or Pinal County approved equivalent.

b. In addition, performance Category 6A UTP Copper Cable must meet the following mechanical and...
performance criteria:

- Exceeds requirements of ANSI/TIA-568-C.2 Category 6A and ISO 11801 Class EA channel standards.
- Guaranteed +8 dB over TIA 568-C.2 Standard for both PSANEXT & PSAACRF.
- Meets requirements of IEEE 802.3af and IEEE 802.3at for PoE applications.
- Third party tested to comply with ANSI/TIA-568-C.2.
- Cable diameter: Plenum 0.275 in.
- Installation temperature range: 32°F to 140°F (0°C to 60°C).
- Operating temperature range: -4°F to 194°F (-20°C to 90°C).
- Include advanced Mosaic Crossblock™ tape to suppress the effect of alien crosstalk allowing 10 Gb/s transmission, while minimizing cable diameter.
- Descending length cable markings enable easy identification of remaining cable which reduces installation time and cable scrap.

  a. See Appendix A at the end of this document for cable part numbers.

8. Wireless Access Points (WAPs) Category 6A Unshielded Twisted Pair Cable

  b. Inside 4 pair horizontal cable for Pinal County facilities shall be white jacketed plenum rated GenSPEED® 10 MTP™ Category 6A UTP Copper Cable with Mosaic Crossblock™ Technology or Pinal County approved equivalent.

  c. In addition, performance Category 6A UTP Copper Cable must meet the following mechanical and performance criteria:

- Exceeds requirements of ANSI/TIA-568-C.2 Category 6A and ISO 11801 Class EA channel standards.
- Guaranteed +8 dB over TIA 568-C.2 Standard for both PSANEXT & PSAACRF.
- Meets requirements of IEEE 802.3af and IEEE 802.3at for PoE applications.
- Third party tested to comply with ANSI/TIA-568-C.2.
- Cable diameter: Plenum 0.275 in.
- Installation temperature range: 32°F to 140°F (0°C to 60°C).
- Operating temperature range: -4°F to 194°F (-20°C to 90°C).
- Include advanced Mosaic Crossblock™ tape to suppress the effect of alien crosstalk allowing 10 Gb/s transmission, while minimizing cable diameter.
- Descending length cable markings enable easy identification of remaining cable which reduces installation time and cable scrap.
d. See Appendix A at the end of this document for cable part numbers.

9. Distributor I (Horizontal Patch Panels) – Angled standard density patch panels

a. Pinal County copper patch panels in the horizontal patch fields shall angled 1 RU or 2 RU Mini-Com® Modular Faceplate Patch Panels, or approved equivalent, as needed to accommodate UTP cable quantity.

b. Modular patch panels shall be standard density of 48 ports per rack unit with front removable retaining plates so installing work may be done from the front of the rack in tight spaces.

c. Contractor shall populate modular panels with black Panduit Category 6/6A jacks, or approved equivalent as described elsewhere in this document. See Appendix A for part numbers on jacks to go with modular patch panels.

d. Patch Panels shall further meet the following criteria:
   - Have release snap feature on faceplate to allow front access to installed modules.
   - Accept Mini-Com® Modules for UTP, fiber optic, and audio/video, which snap in and out for easy moves, adds, and changes.
   - Be available in label versions available for easy port identification, with replacement label/label covers available.
   - Mount to standard EIA 19" racks or 23" racks with optional extender brackets.
   - Be available in angled patch panels to facilitate proper bend radius control and minimize the need for horizontal cable managers.

e. For detailed part numbers see “Appendix A” at the end of this document.

10. Work Areas - Small Diameter Category 6 Copper Patch Cords

a. Copper patching of Category 6 links in Pinal County facilities shall use white Panduit 28 awg “small diameter” patch cords.

b. If other color patch cords are needed to designate particular applications, see Appendix A for instructions on changing patch cord colors.

c. Small diameter patch cords shall have the following characteristics:
   - Cable diameter not more than 0.150 in. (3.8mm) nominal.
   - Category 6/Class E channel and component performance.
   - Exceeds all ANSI/TIA-568-C.2 Category 6 and ISO 11801 Class E Edition 2.1 electrical performance requirements for all frequencies from 1 to 250 MHz.
11. Wireless Access Points (WAPs) Small Diameter Category 6A Copper Patch Cords

a. Copper patching of Category 6A links in Pinal County facilities shall use “White” Panduit 28 awg “small diameter” patch cords.

b. If other color patch cords are needed to designate particular applications, see Appendix A for instructions on changing patch cord colors.

c. Small diameter patch cords shall have the following characteristics:
   - Cable diameter not more than 0.185 in. (4.7mm) nominal.
   - Category 6A/Class EA channel and component performance.
   - Exceeds all ANSI/TIA-568-C.2 Category 6A and ISO 11801 Class EA electrical performance requirements for all frequencies from 1 to 500 MHz
   - IEC compliance: Meets IEC 60603-7
   - PoE compliance: Meets IEEE 802.3af and IEEE 802.3at for PoE applications in bundle sizes up to 48 cables.
   - Operating temperature: 14°F to 140°F (-10°C to 60°C).
   - Storage temperature: -40°F to 158°F (-40°C to 70°C).
   - Plug housing: UL94V-0 rated clear Polycarbonate.
   - Contacts: Gold plated phosphor bronze.
   - RoHS compliance: Compliant.
- Flammability rating: CM/LSZH dual rated.

d. Due to miniature size of patch cords, utilize increased attenuation de-rating value of 1.9. These supports 96 meter channels that include 90-meter permanent links, and 6 meters of patch cord. A channel using 10 meters total of patch cord would support 93-meter channels.

e. See Appendix A for part numbers.

12. Surface Mount Raceway – Wall Mount

a. On brownfield installations, Contractor shall match raceway to that already installed in the facility unless instructed otherwise in project-specific documentation.

b. On Greenfield installations where environment (cinder block walls) or project documentation requires cable to be surface-mounted in the work area; horizontal cable shall be routed through Panduit LD10 International White (color), plastic “latching-duct raceway or Pinal County approved equivalent.

c. Contractor is responsible to size raceway to accommodate not less than 40% fill upon installation, per manufacturer fill tables, providing room for at least 50% growth in additional cables; i.e. a work area requiring 4 cables, raceway shall be sized to hold 6, etc. LD10 will allow up to 8 CAT6 cables at a max OD of .240. If over this limit, replace LD10 with Panduit T45/T70 series surface raceway according to cable fill ratio.

d. Contractor is responsible that LD10 raceway installation includes all associated fittings, drop ceiling fittings, couplers and 1” control-bend-radius fittings.

e. Contractor shall not rely on the pressure sensitive adhesive foam to mount raceway, but rather use adhesive to hold raceway in place while screwing down the raceway to the structure beneath using anchors appropriate to the wall type at intervals not to exceed 2 ft. (24 inches).

f. Standard LD-10 Panduit raceway shall have the following features:

- For routing data and low voltage cabling.
- One-piece hinged design allows cables to be laid in.
- Factory applied adhesive backing speeds installation.
- FT4 rated.
- Terminates using surface mount outlet box solutions or Panduit Mini-Com surface mount boxes

g. Installations requiring raceway shall use the same faceplates used in flush-mount applications as specified in this document, mounted on Panduit “JB1” surface boxes, or Pinal County approved equivalent. Pinal County shall not rely on adhesive-backing to hold surface boxes in place, but must use appropriate wall anchors for firm, permanent installation.

h. T45/T70 Pan-Way® Fast-Snap™/Snap-On Technology - Pan-Way® Fast-Snap™ Surface Mount Boxes assemble without the use of screws or additional hardware and can accommodate both power and communication applications. Fast-Snap™ Boxes can accept any standard NEMA 70mm screw-on faceplate. Pan-Way® Snap-On Faceplates attach directly to Fast-Snap™ Boxes, any 70mm raceway, Cove, or Pan-Pole™ device without the use of screws or additional hardware.
i. Standard T45/T70 Pan-Way® Surface Raceway shall have the following features:
   • allows multiple inline access points for space optimization and aesthetic installation
   • supports any NEMA standard screw-on faceplate with use of device bracket and can reduce to smaller profile raceway (T-45 or LD raceway)
   • shall have a modular divider wall that allows channel configuration flexibility

j. See Appendix A at the end of this document for part numbers.

13. Modular Furniture Raceway

a. Office and administrative areas repurposing used modular furniture may require additional cable pathway space and shall utilize Pan-Way © Office Furniture Raceway System, or a Pinal County approved equivalent.

b. Such modular furniture raceway shall provide cable paths along the top of modular furniture partitions dropping services (equipment outlets) at work surface level.

c. Modular furniture raceway must meet the following requirements:
   • UL listed in accordance with UL-5C requirements for Class 2 Communication Cable Management Systems.
   • Maintains bend radius control throughout the entire office furniture raceway system as required by TIA/EIA-568-B and 569-B.
   • Faceplates are compliant with the labeling requirements of the TIA/EIA-606-A standard.
   • Robust design and tamper resistant closure increases product stability and prevents damage to cabling during and after installation.
   • Product supplied with adhesive backing for fast and easy installation.
   • Creates a virtually invisible solution for routing data cables on panels from all common manufacturers with a top cap width between 1.88" and 2.30".
   • Designed for use with Pan-Net Connectivity, also accepts all common manufacturers’ connectivity with use of a NEMA standard 70mm faceplate or module frame.

d. Consult Appendix A for part numbers.

14. Communications Poles

a. Many Pinal County offices use data communications poles to deliver data cables from the ceiling into the modular furniture.

b. Communications poles shall be Pan-Way® Pan-Pole™ Aluminum Outlet Poles for Power and Communication (or Pinal County approved equivalent), and must have the following properties:
   • Pan-Pole™ Communication Poles provide industry-leading solutions for cable routing in the open-office environment.
   • These aluminum poles accept 70mm snap-on faceplates, as well as NEMA-standard screw-mount
faceplates, and are provided with non-metallic 70mm (2.75”) covers.

- Communications poles are available in both 11- and 13-foot lengths.
- The single-channel communication-only pole allows for field installation of telephone, data network, or other low-voltage cabling.

15. See Appendix A for part numbers for 11’ and 13’ communications poles.

B. Cabling Subsystems II and III - Intrabuilding and Interbuilding Backbone Fiber

1. Singlemode Fiber Trunks for Use Within and Between Buildings

   a. On additions to existing Pinal County fiber cable plant (brownfield projects), Contractor shall match existing fiber and connector types.

   b. In new (Greenfield) Pinal County projects, backbone fiber running within buildings or running outdoors between buildings shall be Panduit singlemode, indoor/outdoor, plenum-rated, armored cable, or Pinal County approved equivalent.

   c. The purpose for standardizing on a single cable construction for any environment is to reduce total part numbers needed, and eliminate the need for costly innerduct installation and transition splicing where fiber trunks enter buildings.

   d. Singlemode trunks running between buildings shall be of 24 or 48 strands as indicated by project documentation.

   e. Singlemode trunks running between telecom rooms within buildings shall be of 12 strands unless otherwise indicated in project documentation.

   f. Fiber cable shall further meet the following qualifications:

      - Panduit® Opti-Core® Indoor/Outdoor Armored Cable with tight buffered fibers are an integral part of the Panduit end-to-end fiber optic solution, designed to support today’s data needs while meeting tomorrow’s ever-advancing network requirements.

      - This cable provides water blocking technology, high density, and easy installation in transitional aerial and duct applications and entrance facilities, and the 900μm tight-buffered fibers provide easy connectorization.

      - The tight-buffered fibers surrounded by aramid yarn strength members combine usability indoors and out. Interlocking aluminum armor eliminates the need for inner duct or conduit to provide a smaller crush resistant pathway for improved design flexibility and lower installed cost.

      - Cables with greater than 24 fibers feature a sub-unit design that simplifies fiber identification, provides easy access and routing of the fibers. It also increases cable durability with a dielectric central strength member.

      - Opti-Core® Fiber Optic Indoor/Outdoor Riser (OFNR) and Plenum (OFNP) Rated Cable with tight buffered fibers are tested in accordance with Telcordia GR-20, Issue 2, GR-409 and with relevant EIA/TIA-455 series FOTPs for fiber optic cable.

      - All multimode and singlemode cable is available in 2, 4, 6, 8, 12, and 24-fiber counts as a “non-subunitized” design and in 36, 48, 72, and 96-fiber counts (144 for Riser) as a “sub-unitized” design.
• All Opti-Core® fiber cable is RoHS compliant.

g. Plenum armored cable shall meet the following physical properties:

<table>
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<th>Fiber Count</th>
<th>Cable O.D. Inches (mm)</th>
<th>Installation Bend Radius Inches (cm)</th>
<th>Long-Term Bend Radius Inches (cm)</th>
<th>Cable Weight Lb./kft. (kg/km)</th>
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<tr>
<td>2</td>
<td>0.45 (11.4)</td>
<td>4.5 (11.5)</td>
<td>9.0 (22.9)</td>
<td>81 (120)</td>
</tr>
<tr>
<td>4</td>
<td>0.45 (11.4)</td>
<td>4.5 (11.5)</td>
<td>9.0 (22.9)</td>
<td>85 (127)</td>
</tr>
<tr>
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<td>4.7 (12.0)</td>
<td>9.4 (23.9)</td>
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<tr>
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<td>4.8 (12.2)</td>
<td>9.4 (23.9)</td>
<td>91 (135)</td>
</tr>
<tr>
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<td>511 (760)</td>
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h. Contractor shall bond to ground armor from fiber backbones at both ends as indicated in the grounding section of this document; using armored cable grounding kits listed in the Appendix A grounding section.

i. See Appendix A for all fiber cable part numbers.

2. LC Fiber Connectors

a. All tight-buffered indoor fiber trunks shall be terminated using Panduit singlemode LC OptiCam® Fiber Optic Connectors or Pinal County approved equal.

b. LC cam connectors shall further have the following properties:

- Be a TIA/EIA-604 FOCS-10 compatible connector that exceed TIA/EIA-568-B.3 requirements.
- Have connector backbone and boot colors that follow TIA/EIA-568-C.3 suggested color identification scheme.
- Have insertion loss: 0.3dB average (multimode and singlemode).
- Have return loss: >26dB (10Gig — multimode), >20dB (multimode), >50dB (singlemode).
- Be a spring-loaded “Senior” rear pivot latch LC connector.
- Be a pre-polished cam style termination for in less than half the time of field polish connectors.
- Have patented re-termination capability provides yield rates approaching 100%.
• Feature a factory pre-polished fiber end face eliminates time-consuming field polishing to reduce installation costs, labor, scrap and the number of tools required.

• Be cam activated, with fiber and buffer clamp mechanisms that provide superior fiber and buffer retention with less sensitivity to fiber tensile loading.

• Utilize the OptiCam® Termination Tool that simplifies tooling and termination, and virtually eliminates operator error by providing a visual indication of proper termination after the cam step has been completed.

• Have a range of cable retention boot assemblies that consistently provide higher than industry standard cable retention.

• Include a non-optical disconnect that maintains data transmission under tensile loads for jacketed cable.

• Have ability to accept 900μm tight-buffered fiber with included boot(s), and accept 1.6mm – 2.0mm and 3.0mm jacketed cable with available OptiCam® Cable Retention Boot Assemblies (ten per package).

  c. See Appendix A for part numbers on singlemode LC fiber connectors.

3. Fiber Enclosures

a. Fiber cable terminations shall be contained in 1 RU, or 2 RU Panduit FCE series rack mount fiber enclosures, or Pinal County approved equal.

b. Contractor shall select enclosure size as needed for the number of fibers projected to be in that telecommunication space when fully populated.

c. Contractor shall fill any unused enclosure space with a blank fiber adapter panel (FAP).

d. FCE enclosures shall further have the following properties:

  • Be able to hold QuickNet™ Fiber Optic Cassettes, Opticom® Fiber Adapter Panels, or splice modules.

  • Have a slide-out, tilt-down drawer to provide full front access to all fibers and cables.

  • Employ integral bend radius control and cable management appliances for fiber optic patch cords.

  • Have rear cable management for proper slack/melting of trunk cable break-outs and interconnect cables.

  • Have multiple trunk cable entry locations and include fiber optic cable routing kit (grommets, cable ties, spools, strain relief bracket, and ID/caution labels) for different installation configurations.

4. Fiber Adapter Panels

a. FCE fiber enclosures shall be populated with fiber adapter panels containing 6 singlemode duplex fiber adapters.

b. Contractor is responsible to blank out any enclosure spaces where adapter panels are not used.

c. Adapter panels shall further have the following features:

  • Loaded with TIA/EIA-604 FOCIS-10 compatible adapters.

  • Exceed TIA/EIA-568-B.3 requirements.
• Adapter housing colors follow TIA/EIA-568-C.3 suggested color identification scheme.
• Snap quickly into the front of all Opticom® components
• LC fiber adapter panels are Sr/Jr. to conserve enclosure space.
• Accept FOCIS-10 compatible senior LC connectors at either end and FOCIS-10 junior LC connectors at the inside end for behind the wall applications.
• Both ends accept FOCIS-10 compatible senior LC connectors.
• Junior end also accepts FOCIS-10 compatible junior (fixed ferrule/springless) LC connectors.
• Choice of phosphor bronze or zirconia ceramic split sleeves to fit specific network requirements; zirconia ceramic split sleeves are recommended for OM4/OM4 multimode and OS1/OS2 singlemode applications.
• Every adapter is laser marked with Q.C. number to assure 100% traceability.
• LC adapters are also available in QuickNet™ Fiber Optic Cassettes.

d. Consult Appendix A for fiber adapter panels and blank adapter panels.

5. Fiber Patch Cords

a. Fiber patch fields within Pinal County facilities shall utilize riser rated singlemode “push/pull” fiber jumpers (fiber patch cords) that have the following properties:

• Push-Pull LC Duplex Fiber Optic Patch Cords shall feature the push-pull strain relief boot and duplex clip, to allow users easy accessibility in tight areas when deploying very high density LC patch fields.
• Jumpers shall be available in OM3, OM4 and single-mode and be available in in riser (OFNR), plenum (OFNP), and low smoke zero halogen (LSZH) rated jacket materials.

b. See “Appendix A” at the end of this document for part numbers.

C. Cable Pathways

1. Overhead Metallic Pathway

a. Cable delivery over racking systems in telecommunications rooms shall be done with Wyr-Grid® overhead cable tray routing system or Pinal County approved equal.

b. Any pathway offered must have the following properties:

• Wyr-Grid® Pathways are provided in four widths: 12” (305mm), 18” (457mm), 24” (610mm), and 30” (762mm).
• Wyr-Grid® System incorporates non-integral snap-on sidewalls which minimize specification requirements and are offered in three different heights: 2” (50mm), 4” (102mm), and 6” (152mm).
• Wyr-Grid® Splice Connectors have an integral bonding screw that creates a mechanical-electrical bond between cable tray pathway sections.
• Wyr-Grid® Waterfalls are offered in two different configurations that attach to all pathway sections: 12" (305mm), 18" (457mm), 24" (610mm), and 30" (762mm) to facilitate bend radius control and cable management.

• Wyr-Grid® Support Brackets are offered in various widths to accommodate pathways: 12" (305mm), 18" (457mm), 24" (610mm), and 30" (762mm); have integral quick-clip retention; accommodate 1/2" or 12 mm threaded rods.

  c. All metallic cable trays must be grounded and all sections bonded in accordance with listing requirements for the particular type of system and per TIA 607-B including most recent revisions, TSB and addenda.

  d. Contractor is responsible sizing all pathways to represent no more than a 35% fill upon installation per manufacturer’s fill chart below:

### Wire Fill for Wyr-Grid® Overhead Cable Tray Routing System

<table>
<thead>
<tr>
<th>X (in.)</th>
<th>Y (in.)</th>
<th>Internal Area (in²)</th>
<th>Category 6A (SD) Diameter 6.1mm 0.240&quot;</th>
<th>Category 6A Diameter 6.1mm 0.300&quot;</th>
<th>Category 6 Diameter 6.1mm 0.240&quot;</th>
<th>Category 6 Diameter 6.1mm 0.300&quot;</th>
</tr>
</thead>
<tbody>
<tr>
<td>12.2</td>
<td>2</td>
<td>24.3</td>
<td>269</td>
<td>172</td>
<td>269</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>48.7</td>
<td>538</td>
<td>344</td>
<td>536</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>73.0</td>
<td>807</td>
<td>516</td>
<td>807</td>
<td></td>
<td></td>
</tr>
<tr>
<td>24.2</td>
<td>2</td>
<td>48.3</td>
<td>534</td>
<td>342</td>
<td>534</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>96.6</td>
<td>106</td>
<td>604</td>
<td>1069</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>145.9</td>
<td>1603</td>
<td>1026</td>
<td>1603</td>
<td></td>
<td></td>
</tr>
<tr>
<td>18.2</td>
<td>2</td>
<td>36.3</td>
<td>401</td>
<td>257</td>
<td>401</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>72.7</td>
<td>804</td>
<td>514</td>
<td>804</td>
<td></td>
<td></td>
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<tr>
<td>6</td>
<td>109.0</td>
<td>1205</td>
<td>771</td>
<td>1205</td>
<td></td>
<td></td>
</tr>
<tr>
<td>30.2</td>
<td>2</td>
<td>60.3</td>
<td>666</td>
<td>427</td>
<td>666</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>120.7</td>
<td>1334</td>
<td>854</td>
<td>1334</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>181.0</td>
<td>2000</td>
<td>1280</td>
<td>2000</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Y* equates to the height of the Wyr-Grid® Optional Sidewalls. The internal area defines the allowable fill capacity based on the Wyr-Grid® Pathway width and optional sidewall height. The Wyr-Grid® Pathway cable fill is based on NEC allowable fill of 50%. The above cable diameters represent the nominal Panduit cable diameter per performance level.

e. All cable trays and grounding conductors should be clearly marked in accordance with manufacturer’s instructions, applicable codes, standards and regulations.

f. Contractor shall take care to segregate and protect armored fiber from copper cabling in metallic pathway.

g. Bundled copper and fiber backbones shall be dressed to maintain segregation of cable types throughout the pathway. Innerduct or separate fiber duct is not necessary due to armored construction on fiber backbone.

h. See Appendix A for part numbers.

2. **J-Hooks**

  a. Bundles of 120 Category 6 cables or less may be required to be routed above ceilings using J-hooks. Check project documentation for clarification.

  b. J-hook systems used by Pinal County shall be Panduit “J-Pro” series, or Pinal County approved equivalent.
c. Contractor installing J-hook systems shall space them no more than 5 feet apart as per TIA 569-C standard.

d. Contractor is responsible for proper sizing of J-hook systems based upon cable count and manufacturers recommendations for fill, with new J-hooks to have not more than 30% fill per manufacturer’s fill charts based upon projected worst case future bundle size.

e. If J-hooks are deemed too small by above criteria, Contractor shall bring this to the attention of Pinal County for resolution in writing. J-hook pathways that will not have sufficient capacity should be replaced in the design with the proper sized basket tray for future cable additions and flexibility.

f. J-hook systems used by Pinal County shall have the following properties:
   - Patented design provides complete horizontal and vertical 1” bend radius control that helps prevent degradation of cable performance.
   - UL 2043 and CAN/ULC S102.2 listed and suitable for use in air handling spaces.
   - Pre-riveted assemblies allow for attachment to walls, ceilings, beams, threaded rods, drop wires and underfloor supports to meet requirements of a variety of applications.
   - Wide cable support base prevents pinch points that could cause damage to cables.
   - Cable tie channel allows user to easily install 3/4” (19.1mm) Tak-Ty® Cable Ties to retain cable bundle.
   - Durable non-metallic J Hook materials provide the ability to manage and support a large number of cables.
   - Material: Black Nylon 6.6 J Hook with metal attachments.

D. 19” Racks and Rack-mount Cable Managers

1. Two-post Communications Racks

   a. 2-post racks will be Panduit black-powdered aluminum (or Pinal County approved equivalent) and have the following properties:
      - 19” EIA rack, aluminum.
      - Dimensions: 96.0”H x 20.3”W x 3.0”D (2134mm x 514mm x 76mm).
      - Rack units numbering up from bottom to allow quick and easy location of rack mount items
      - UL listed for 1,000 lbs. load rating.
      - Double-sided #12-24 EIA universal mounting hole spacing with 24 #12-24 mounting screws included.
      - Accepts all Panduit cable management and patch panel products in addition to any industry standard 19” components.
      - Includes paint piercing washers for assembly to assure electrical continuity between components as pert TIA 607-B Bonding and Grounding Standard.
b. In telecommunications rooms with multi-bay rack rows configured such that patching will take place between racks, Contractor is responsible to include in design interbay routing pathways at the top, middle and bottom of each bay to provide efficient and neat routing between any two points within rack rows.

c. Interbay routing shall be provided in the form of top troughs, interbay mid-rack path and flanged shelf at the bottom. (See “Illustration of Interbay Routing” below).

d. For bottom-of-rack interbay routing where cable quantities exceed capacity of CMUT19 troughs, Contractor shall substitute 4RU trough CMLT19.

e. All racks shall be outfitted with a vertical grounding busbar along one rail, with all equipment bonded to ground according to TIA 607-B Bonding and Grounding Standard. See Bonding and Grounding section of this document for details.

f. See Appendix A for part numbers.
2. Rack-mounted Cable Management – Vertical Managers

   a. Vertical cable managers shall be PatchRunner™ High Capacity Vertical Cable Management System in sizes 6” wide, 8” wide, 10” wide and 12” wide, or Pinal County approved equivalent.

   b. Contractor will use double sided (front and back) vertical managers on 2-post racks.

   c. All vertical cable managers shall have metal dual hinged doors.

   d. Contractor shall choose vertical cable manager width according to manufacturer’s fill tables to not represent more than a 35% fill at installation based on projected worst-case density when racks are fully populated.

   e. Vertical cable managers shall have the following features:

       • High density minimizes area required for network layout, freeing up valuable floor space.

       • Allows mounting of many standard EIA 19" accessories, such as patch panels, vertically in the manager.

       • Ventilated side walls provide maximum airflow for equipment cooling.

       • Snap on finger sections can be removed to improve airflow, and break away fingers allow routing of large cable bundles.

       • Large finger spacing accommodates up to 48 Cat6A cables.

       • Optional sure-close dual hinged metal doors provide easy access to vertical pathway and provide visual and audible feedback on closure.

       • Available in 7 foot version.

   f. In IDF rooms or areas where there are low cable counts, vertical cable managers shall be 4” wide NetRunner™ Vertical Cable Manager, dual sided.

   g. Part numbers are listed in Appendix A.

3. Rack-mounted Cable Management – Horizontal Managers

   a. Angle patch panels largely the need for horizontal cable managers, but there still may be instances requiring them. One example is in the network core where chassis switches are used.

   b. For these areas requiring horizontal cable managers, Contractor shall use double-sided NetManager™ High Capacity Horizontal Cable Managers (or Pinal County approved equal) having the following features:

       • Innovative inset fingers slope inward toward back of managers offering unobstructed access to network cabling for easier moves, adds, and changes.

       • Large front finger openings easily accommodate Category 6A and 10 GbE cables, speeding installation and reducing maintenance costs.

       • Rear cable management finger spacing utilizes open D-rings for greater accessibility.

       • Can be used to create large capacity horizontal pathways for routing cable.
• Patented front and rear dual hinged cover allows cable access without removing cover.
• Curved surfaces maintain cable bend radius.
• Pass-through holes allow for front to rear cabling.
• Built in cable retainers hold cable in place for easy moves, adds, and changes.
• Mount to 19” EIA racks and cabinets.
• Covers, #12-24 and M6 mounting screws included.

c. See Appendix A for part numbers.

E. Cable Accessories

1. Cable Ties

a. Cable bundles on racks and in pathways shall be bundled with re-enterable hook and loop cable ties that come in continuous rolls.

b. Contractor is responsible for using plenum hook and loop ties in air-return spaces.

c. See “Appendix A” for part numbers.

2. Physical Security Devices

a. Some portions of Pinal County networks require additional physical security devices. These take three forms:
  • Devices that block-out copper and fiber ports in patch fields and faceplates that require a special tool for removal.
  • Devices that lock-in copper patch cords and require a special tool for removal of those patch cords.
  • Devices that temporarily or permanently block USB ports on laptops and computers.

b. Areas where such devices are required will be called out in the project documentation.

c. See Appendix A for part numbers.

F. Communications Grounding Network

1. General

a. Contractor is responsible for bonding to ground all newly placed equipment and installed racks or cabinets per the TIA 607-C Standard.

2. Room Busbars

a. All Telecommunications spaces and distributor rooms shall have installed an appropriately sized wall-mount busbar with BICSI hole spacing that bonds to the building bonding backbone.
b. See Appendix A for appropriate room telecommunications grounding busbar.

3. Rack and Equipment Grounding

a. Contractor is responsible for properly grounding all network equipment, racks and cabinets and bonding them to the wall mounted busbars as described in the TIA 607-C standard.

b. All newly installed racks and cabinets shall have installed a vertical busbar mounted along one equipment rail to serve as a clean, low-resistance bonding place for any equipment not equipped with a designated grounding pad.

c. Smaller equipment without an integrated grounding pad shall be bonded to the vertical busbar through the use of a thread-forming grounding screw that is anodized green and includes serrations under the head to cut through oxidation or paint on the equipment flange.

d. Larger equipment (chassis switches) with a designated grounding terminal shall be bonded to the vertical busbar with an EBC (equipment bonding conductor) kit built to that purpose.

e. Contractor shall take care to clean (wire brush, scotchbrite pads) any metallic surface to be bonded down to bare metal and apply a film of anti-oxidation paste to the surfaces prior to effecting the bond.

f. All bonding lugs on racks and busbars shall be of two-hole irreversible compression type. Mechanical lugs and single-hole lugs will not be accepted and shall be removed and replaced at Contractor's expense.

g. Every rack or cabinet shall have an individual bonding conductor into the grounding network, serially connecting (daisy-chaining) of racks is expressly forbidden and will not be accepted.

h. Rack Bonding Conductors (RBC) may tap into an overhead or underfloor aisle ground, or may run to the wall-mounted grounding busbar in smaller Telecommunications rooms containing 5 racks or less.

i. A minimum of every other rack or cabinet shall be outfitted with a properly installed and bonded ESD (electro-static discharge) port along with a wrist strap and lead to be used by any technicians servicing network equipment. On four post racks and cabinets these ESC ports and straps shall be provided on front and back to be accessible and able to reach any active equipment needing servicing.

j. Armored cables shall be properly bonded to the earthing system on both ends with a kit built to that purpose.

k. For examples of rack grounding refer to the illustrations below:
IV. Network Labeling

A. General Requirements

1. When labeling any Pinal County network system, whether existing or new, Contractor shall always adhere to the following requirements:

   a. Contractor shall, wherever possible pre-print labels using Panduit Easy-Mark software and laser jet printer, or Pinal County approved equivalent.

   b. The Panduit PanTher (LS8E) hand-held thermal transfer printer or Pinal County approved equivalent shall be used on site to print labels that were unanticipated, or that become damaged in application.

   c. This labeling strategy shall, at a minimum, clearly identify all components of the system: racks, cables, panels and outlets, grounding, pathways and spaces like telecommunications rooms.

   d. Racks and patch panels shall be labeled to identify the location within the cable system infrastructure.

   e. All labeling information shall be recorded on the as-built drawings and all test documents shall reflect the appropriate labeling scheme.

   f. All label printing will be machine generated by either hand-held labeling systems or computer generated using programs and materials built specifically for communications labeling.

   g. Hand written labels will not be accepted and must be remedied at Contractors expense.

   h. Cabling system labels shall utilize materials designed to outlast the cabling elements to which they attach. Office quality labels will not be accepted.

   i. Cable labels shall be self-laminating, appropriately sized to the outside diameter of the cable and placed within view at the termination point on each end.

   j. Outlet, patch panel and wiring block labels shall be installed on, or in, the space provided on the device.

   k. Machine-generated labels shall be installed behind the clear lens or cover on any device that provides such an option.

   l. All labels will be permanently affixed to installed cables, patch panels, racks, cabinets, and enclosures.

   m. Labels shall be legible and placed in a position that insures ease or visibility. Label type must be as listed in Appendix A - Materials section at the end of this document.

   n. Conduit shall be marked indicating the identification of the cable within.

   o. All cabling added to existing "legacy" installations shall follow the labeling convention in place at that location.

   p. All labeling of installed cabling in new (Greenfield) projects shall satisfy all requirements of TIA 606-B, or be modified as indicated in the project specific documentation.

<END OF SECTION>
V. Testing and Acceptance

A. General

1. All cables and termination hardware shall be 100% tested for defects in installation and to verify cabling system performance under installed conditions.

2. All copper pairs or optical fibers of each installed cable shall be tested and verified prior to system acceptance.

3. Any defect in the cabling system performance or installation including but not limited to cable, connectors, feed through couplers, patch panels, and connector blocks shall be repaired or replaced in order to ensure 100% useable conductors or fibers in all cables installed.

4. All cables shall be tested in accordance with this document, the ANSI/TIA Standards, the PANDUIT® ™ System Warranty guidelines and best industry practice.

5. If any of these are in conflict, the Contractor shall bring any discrepancies to the attention of the project team for clarification and resolution.

B. Copper Link Testing

1. All twisted-pair copper cable links shall be tested for compliance to the requirements in ANSI/TIA 1152 and ANSI/TIA 568-C.2 for the appropriate Category of cabling installed using a test unit meeting a minimum IEC IIIe level of accuracy.

2. All testers used must have been factory calibrated by the manufacturer within one year of use or according to factory calibration recommendations, whichever is the more stringent.

3. Contractor shall set references according to manufacturer’s recommendation prior to each day’s testing and reset references anytime tester is left unused for more than two hours.

4. For warranty purposes, Contractor shall perform the appropriate Permanent Link test. Channel Link testing is rendered void by the movement of patch cords and can be run but not used for final acceptance criteria.

C. Fiber Testing

1. All installed fiber shall be tested for link-loss in accordance with ANSI/TIA-C.0 and shall be within limits specified within ANSI/TIA-C.3, or as spelled out in the project documentation.

2. For horizontal cabling system using multimode optical fiber, attenuation shall be measured in one direction at either 850 nanometer (nm) or 1300 nm using an LED light source and power meter.
3. Attenuation testing shall be performed with a stable launch condition using two-meter jumpers to attach the test equipment to the cable plant. The light source shall be left in place after calibration and the power meter moved to the far end to take measurements.

4. Backbone single-mode fiber cabling shall be tested at the 1310 and 1550 wavelengths in both directions.

5. Test set-up and performance shall be conducted in accordance with ANSI/568-C.0 standard, Method B.

6. Where links are combined to complete a circuit between devices, the Contractor shall test each link from end to end to ensure the performance of the system. Only basic link-loss testing with a power meter is required. The contractor can optionally install patch cords to complete the circuit and then test the entire channel. The test method shall be the same used for the test described above.

7. The values for calculating loss shall be those defined in the ANSI/TIA 568-C.3 Standard. If the link loss requirements defined within the standard are in conflict with those referenced in the project documentation, Contractor shall immediately bring this to the attention of Information Technologies for resolution.

D. System Documentation

1. Upon completion of the installation, the telecommunications contractor shall provide three (3) full documentation sets to Pinal County for approval. Documentation shall include the items detailed in the sub-sections below.

2. Documentation shall be submitted within ten (10) working days of the completion of each testing phase. This is inclusive of all test results and draft as-built drawings. Draft drawings may include annotations done by hand. Machine generated (final) copies of all drawings shall be submitted within 30 working days of the completion of each testing phase.

3. Contractor shall submit with drawings a diagram of each telecommunications room with indicating which cabling drops will terminate in which rooms (classrooms). This is both to give an idea of contractor cableplant design, as well as to facilitate future troubleshooting.

4. At the request of the Information Technologies Engineer, the telecommunications contractor shall provide copies of the original test results in tester native format, not spreadsheet.

5. Information Technologies may request that a 10% random field re-test be conducted on the cable system, at no additional cost, to verify documented findings. Tests shall be a repeat of those defined above. If findings contradict the documentation submitted by the telecommunications contractor, additional testing can be requested to the extent determined necessary by Information Technologies, including a 100% re-test. This re-test shall be at no additional cost to the Pinal County.
E. Test Results

1. Documentation shall be provided in electronic format within three weeks after the completion of the project. The media shall be clearly marked on the outside front cover with the words “Project Test Documentation”, the project name, and the date of completion (month and year).

2. The results shall include a record of test frequencies, cable type, conductor pair and cable (or outlet) I.D., measurement direction, reference setup, and crew member name(s). Documentation shall also include test equipment name, manufacturer, model number, serial number, software version and last factory calibration date.

3. Unless the manufacturer specifies a more frequent calibration cycle, an annual calibration cycle is anticipated on all test equipment used for this installation.

4. The test document shall detail the test method used and the specific settings of the equipment during the test as well as the software version being used in the field test equipment.

5. Printouts generated for each cable by the wire (or fiber) test instrument shall be submitted as part of the documentation package. Alternately, the telecommunications contractor may furnish this information in electronic form.

6. The media shall contain the electronic equivalent of the test results as defined by the specification along with the software necessary to view and evaluate the test reports.

7. When repairs and re-tests are performed, the problem found and corrective action taken shall be noted, and both the failed and passed test data shall be documented.

8. The As-Built drawings are to include cable routes and outlet locations. Their sequential number as defined elsewhere in this document shall identify outlet locations.

9. Numbering, icons, and drawing conventions used shall be consistent throughout all documentation provided. Pinal County will provide floor plans in paper and electronic (DWG, AutoCAD) formats on which as-built construction information can be added.

10. These documents will be modified accordingly by the Telecommunications Contractor to denote as-built information as defined above and returned to the Pinal County.

11. The Contractors shall annotate the base drawings and return a hard copy (same plot size as originals) and electronic (AutoCAD) form.

<END OF SECTION>
## Appendix A – Materials List

<table>
<thead>
<tr>
<th>Manufacturer</th>
<th>Part Number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>COPPER DISTRIBUTION</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Panduit</td>
<td>MWBA1</td>
<td>Single-gang faceplate brackets – “box eliminators”. An alternative for single gang in-wall box in communication applications. Mounting hole spacing of 3.28” (83.5mm).</td>
</tr>
<tr>
<td>Panduit</td>
<td>MWBA-2G</td>
<td>Double-gang faceplate brackets – “box eliminators”. An alternative for double gang in-wall boxes in communication applications. Mounting hole spacing of 3.28” (83.5mm).</td>
</tr>
<tr>
<td>Panduit</td>
<td>CFPL2IWY</td>
<td>Single gang, vertical faceplate accepts three Mini-Com ® Modules.</td>
</tr>
<tr>
<td>Panduit</td>
<td>CFPL4IWY</td>
<td>Single gang, vertical faceplate accepts four Mini-Com ® Modules.</td>
</tr>
<tr>
<td>Panduit</td>
<td>CFPL6IWY</td>
<td>Single gang, vertical faceplate accepts six Mini-Com ® Modules.</td>
</tr>
<tr>
<td>Panduit</td>
<td>CMBIW-X</td>
<td>Mini-Com blank module to blank out open spaces (holes) on faceplates and patch panels. For colors other than International White, replace “IW” with BL (Black) with EI (Electric Ivory), WH (White), or IG (International Gray).</td>
</tr>
<tr>
<td>Panduit</td>
<td>CBXJ2IW-A</td>
<td>Surface mount box accepts one or two Mini-Com ® Modules; includes built-in removable blank to add a second module. Dimensions: 0.91”H x 1.77”W x 2.44”L (23.11mm x 44.96mm x 61.98mm). Knockout provides opening of 0.47”H x 0.36”W.</td>
</tr>
<tr>
<td>General Cable</td>
<td>7132850</td>
<td>Category 6A, plenum (CMP), 4-pair, UTP copper cable. Copper conductors are 23 AWG with FEP insulation, Conductors are twisted in pairs, separated by an integrated pair divider, surrounded by Mosaic Crossblock™ tape and protected by a low-smoke flame-retardant PVC jacket, 0.275” (7.0mm) diameter. White Jacket</td>
</tr>
<tr>
<td>General Cable</td>
<td>7131901</td>
<td>Category 6 Enhanced, plenum (CMP), 4-pair, UTP copper cable. Copper conductors are 23 AWG construction. Conductors are twisted in pairs, innovative cross-web design allowing for maximum pair separation, increasing key electrical performance parameters, and protected by a low smoke, flame-retardant PVC jacket. White</td>
</tr>
<tr>
<td>General Cable</td>
<td>2131752E</td>
<td>25 pair, plenum rated, Category 5E cable – gray.</td>
</tr>
<tr>
<td>Panduit</td>
<td>CPPLA24WBLY</td>
<td>24-port angled patch panel with labels, supplied with six factory installed CFFPL4 type front removable snap-in faceplates.</td>
</tr>
<tr>
<td>Panduit</td>
<td>CPPLA48WBLY</td>
<td>48-port angled patch panel with labels, supplied with twelve factory installed CFFPL4 type front removable snap-in faceplates. Populate with black Category 6 jacks below.</td>
</tr>
<tr>
<td>Panduit</td>
<td>CPPI48WBLY</td>
<td>48-port flat patch panel with labels, supplied with twelve factory installed CFFPL4 type front removable snap-in faceplates. Populate with black Category 6 jacks below.</td>
</tr>
<tr>
<td>Panduit</td>
<td>CJ6X88TGBL</td>
<td>Category 6A, RJ45, 10 Gb/s, 8-position, 8-wire universal module. Includes patented MaTriX split foil tape. For other standard colors, replace “BL” (Black), with IW (Off White), with EI (Electric Ivory), WH (White), AW (Arctic White), IG (International Gray), OR (Orange), RD (Red), BU (Blue), GR (Green), YL (Yellow), or VL (Violet).</td>
</tr>
<tr>
<td>Panduit</td>
<td>UTP28X*BU</td>
<td>Category 6A/Class EA, UTP, small diameter patch cords shall be constructed of 28 AWG, unshielded, twisted pair, solid copper (dual-rated CM/LSZH) cable with high performance modular plugs. For lengths 1 to 50 feet (increments of one foot), replace * with desired length in feet. For standard cable colors other than Off White, replace “BU” (Blue) with color code: BL (Black), RD (Red), YL (Yellow), GR (Green), OR (Orange), GR (Gray), PK (Pink), or VL (Violet). Cable diameter: 0.185 in. (4.7mm) nominal. No suffix designates Off White</td>
</tr>
<tr>
<td>Panduit</td>
<td>CJ688TGBL</td>
<td>Category 6, RJ45, 8-position, 8-wire universal module – color black. For other standard colors, replace suffix “BL” with IW (Off White), EI (Electric Ivory), WH</td>
</tr>
</tbody>
</table>
Communications Materials

FIBER DISTRIBUTION SYSTEMS

<table>
<thead>
<tr>
<th>Manufacturer</th>
<th>Model</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Panduit</td>
<td>UTP28SP*BU</td>
<td>Category 6/Class E, UTP, small diameter patch cords are constructed of 28 AWG, unshielded, twisted pair, stranded copper (dual-rated CM/LSZH) cable with high performance RJ45 modular plugs. For lengths 1 to 50 feet (increments of one foot), replace ** with desired length in feet. For standard cable colors other than Blue, replace “BU” with color code: BL (Black), RD (Red), YL (Yellow), GR (Green), OR (Orange), GY (Gray), PK (Pink), or VL (Violet). No suffix designates Off White</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Manufacturer</th>
<th>Model</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Panduit</td>
<td>FSLP912</td>
<td>12-fiber OS2 9/125μm singlemode plenum (OFNP) interlocking aluminum armored, indoor/outdoor cable with tight buffered fibers.</td>
</tr>
<tr>
<td>Panduit</td>
<td>FSLP924</td>
<td>24-fiber OS2 9/125μm singlemode plenum (OFNP) interlocking aluminum armored, indoor/outdoor cable with tight buffered fibers.</td>
</tr>
<tr>
<td>Panduit</td>
<td>FSLP948</td>
<td>48-fiber OS2 9/125μm singlemode plenum (OFNP) interlocking aluminum armored, indoor/outdoor cable with tight buffered fibers.</td>
</tr>
<tr>
<td>Panduit</td>
<td>FLCDSBCBUY</td>
<td>LC OptiCams Singlemode Duplex Fiber Optic Connector for 900μm tight-buffered fiber installation.</td>
</tr>
<tr>
<td>Panduit</td>
<td>FCE1U</td>
<td>Opticom® QuickNet™ Rack Mount Fiber Enclosures, holds up to four QuickNet™ Cassettes, FAP adapter panels, or FOSM splice modules. Dimensions: 1.73”H x 17.60”W x 16.30”D (43.9mm x 447.0mm x 414.0mm).</td>
</tr>
<tr>
<td>Panduit</td>
<td>FCE2U</td>
<td>Opticom® QuickNet™ Rack Mount Fiber Enclosures, holds up to eight QuickNet™ Cassettes, FAP adapter panels, or FOSM splice modules. Dimensions: 3.48”H x 17.60”W x 16.30”D (88.4mm x 447.0mm x 414.0mm).</td>
</tr>
<tr>
<td>Panduit</td>
<td>FAP6WBUDLCZ</td>
<td>LC FAP loaded with six LC duplex singlemode fiber optic adapters (Blue) with zirconia ceramic split sleeves.</td>
</tr>
<tr>
<td>Panduit</td>
<td>FAPB</td>
<td>Blank fiber adapter panel – reserves space for future use.</td>
</tr>
<tr>
<td>Panduit</td>
<td>F92ERQNQNSNM001</td>
<td>OS1/OS2 2-fiber, riser-rated, LC push-pull to LC push-pull, singlemode patch cord with custom push-pull strain relief boot and duplex clip, 1.6mm jacket, Std. IL. *** At end of part number is for length in meters. Comes in 1 M increments up to 20 meters, then in lengths of 20 M, 25 M, 30 M, and 35 M. Put length in the following (3 digit) format: 001 for 1 M, 020 for 20 M, etc.</td>
</tr>
</tbody>
</table>

RACKS AND CABLE MANAGERS

<table>
<thead>
<tr>
<th>Manufacturer</th>
<th>Model</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Panduit</td>
<td>R2P</td>
<td>19” EIA 2-post rack, aluminum. Dimensions: 84.0”H x 20.3”W x 3.0”D (2134mm x 514mm x 76mm).</td>
</tr>
<tr>
<td>Panduit</td>
<td>R2PPEVWF</td>
<td>Waterfall Trough for 2 Post Rack and PatchRunner high capacity - Vertical Cable Managers. FOR TOP-OF-RACK INTERBAY ROUTING.</td>
</tr>
<tr>
<td>Panduit</td>
<td>PEV6</td>
<td>High capacity dual-sided vertical manager. Dimensions: 83.5”H x 6.0”W x 28.1”D(2120mm x 152mm x 714mm).</td>
</tr>
<tr>
<td>Panduit</td>
<td>PED6</td>
<td>Dual hinged metal door. Dimensions: 82.8”H x 6.1”W x 1.7”D (2103mm x 155mm x 43mm).</td>
</tr>
<tr>
<td>Panduit</td>
<td>PEV8</td>
<td>High capacity dual-sided vertical manager. Dimensions: 83.5”H x 8.0”W x 28.1”D (2120mm x 203mm x 714mm).</td>
</tr>
<tr>
<td>Panduit</td>
<td>PED8</td>
<td>Dual hinged metal door. Dimensions: 82.8”H x 8.1”W x 1.7”D (2103mm x 206mm x 43mm).</td>
</tr>
<tr>
<td>Panduit</td>
<td>PEV10</td>
<td>High capacity dual-sided vertical manager. Dimensions: 83.5”H x 10.0”W x 28.1”D (2120mm x 254mm x 714mm).</td>
</tr>
<tr>
<td>Panduit</td>
<td>PED10</td>
<td>Dual hinged metal door. Dimensions: 82.8”H x 10.1”W x 1.7”D (2103mm x 256mm x 43mm).</td>
</tr>
<tr>
<td>Panduit</td>
<td>WMPV45E</td>
<td>NetRunner™ Vertical Cable Manager, front and rear, 45 RU, 4”W, with covers</td>
</tr>
<tr>
<td>Panduit</td>
<td>NM1</td>
<td>Horizontal Cable Manager High Capacity Front and Rear 1 Rack Unit. 1.7”H x 19.0”W x 13.1”D (44mm x 482mm x 332mm).</td>
</tr>
<tr>
<td>Panduit</td>
<td>NM2</td>
<td>Horizontal Cable Manager High Capacity Front and Rear 2 Rack Units. 3.5”H x 19.0”W x 13.1”D (88mm x 482mm x 332mm).</td>
</tr>
<tr>
<td>Panduit</td>
<td>NMF3</td>
<td>Horizontal Cable Manager High Capacity Front Only 3 Rack Units. 5.2”H x 19.0”W x 6.2”D (133mm x 482mm x 157mm). FOR MID-RACK INTERBAY ROUTING.</td>
</tr>
<tr>
<td>Panduit</td>
<td>CMUT19</td>
<td>2 RU upper trough with 1.3” bend radius mounts to the top of a standard 19” EIA rack. Dimensions: 3.5”H x 19.0”W x 4.5”D (89mm x 483mm x 114mm). FOR BOTTOM-OF-RACK INTERBAY PATHWAY.</td>
</tr>
<tr>
<td>Panduit</td>
<td>CMLT19</td>
<td>4 RU lower trough with 1.3” bend radius mounts to the bottom of a standard 19” EIA rack. Dimensions: 8.0”H x 19.0”W x 4.5”D (203mm x 483mm x 114mm). FOR BOTTOM-OF-RACK INTERBAY PATHWAY. LARGER OPTION THAN CMUT19 IF NEEDED.</td>
</tr>
</tbody>
</table>

**CABLE PATHWAYS**

<p>| Panduit | LD10IW10-A | LD10 International White Plastic Raceway, see catalog or <a href="http://www.panduit.com">www.panduit.com</a> for fittings. For 8’ sections order LD10IW18-A. For standard colors other than IW (Off White), replace IW in part number with EI (Electrical Ivory) or WH (White). |
| Panduit | JB1IW-A | Single gang one-piece outlet box with adhesive backing. Box accepts Pan-Way® Screw-On Faceplates or any NEMA standard single gang faceplate. For use with Pan-Way® LD profile raceway. 5.09”L x 3.34”W x 1.75”H (129.4mm x 85.0mm x 44.4mm). Breakouts for 1/2”, 3/4”, or 1” diameter conduit. For standard colors other than IW (Off White), replace IW in part number with EI (Electrical Ivory) or WH (White). |
| Panduit | T702BIW8 | Pan-Way® Twin-70 Raceway Base, 8’ sections. For standard colors other than IW (Off White), replace IW in part number with EI (Electrical Ivory) or WH (White). |
| Panduit | T702IW8 | Pan-Way® Twin-70 Raceway Cover, 8’ sections, For standard colors other than IW (Off White), replace IW in part number with EI (Electrical Ivory) or WH (White). |
| Panduit | T45BIW8-A | Pan-Way® T-45 Raceway Base, 8’ sections, For standard colors other than IW (Off White), replace IW in part number with EI (Electrical Ivory) or WH (White). |
| Panduit | T45CIW8 | Pan-Way® T-45 Raceway Cover, 8’ sections, For standard colors other than IW (Off White), replace IW in part number with EI (Electrical Ivory) or WH (White). |
| Panduit | OFR20OB8 | Beige modular furniture raceway. 8’ sections. For fittings, instructions, other colors see <a href="http://www.panduit.com">www.panduit.com</a>. One-piece single channel low voltage raceway with adhesive tape backing for data cable routing along top of modular furniture partitions. |
| Panduit | PCPA13IW | Communications Pole, 13 feet. For fittings see <a href="http://www.panduit.com">www.panduit.com</a>. |
| Panduit | PCPA11IW | Communications Pole, 11 feet. For fittings see <a href="http://www.panduit.com">www.panduit.com</a>. |
| Panduit | T70SDB-X | Communications Pole standard faceplate bracket. For further fittings and accessories see <a href="http://www.panduit.com">www.panduit.com</a>. |
| Panduit | WG12BL10 | 12” wide x 10’ long pathway section used to carry cables horizontally throughout the system. Snap-on sidewalls attach for job specific height requirements. Uses splice connector WGSPL1218BL to connect straight sections and intersection splice WGINTSPLBL to connect pathways at an intersection. For fittings and accessories see <a href="http://www.panduit.com">www.panduit.com</a>. |
| Panduit | WG18BL10 | 18” wide x 10’ long pathway section used to carry cables horizontally throughout the system. Snap-on sidewalls attach for job specific height requirements. Uses splice connector WGSPL1218BL to connect straight sections and intersection splice WGINTSPLBL to connect pathways at an intersection. For fittings and accessories see <a href="http://www.panduit.com">www.panduit.com</a>. |</p>
<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ACG24K</strong></td>
<td>#6 AWG (16mm²) jumper for armored cable diameter up to 0.84&quot; (21.3mm); 24&quot; (609.6mm) length; factory terminated on one end with LCC6 two-hole copper compression lug and the other end with grounding terminal; provided with two each #12-24 and M6 thread-forming screws and a black polypropylene terminal cover.</td>
</tr>
<tr>
<td><strong>LCC series</strong></td>
<td>Panduit two-hole compressing lugs for code conductors in BICSI hole spacing.</td>
</tr>
<tr>
<td><strong>HTCT series</strong></td>
<td>Panduit HTAPs. Must be selected according AWG size of run and tap conductors.</td>
</tr>
<tr>
<td><strong>CLRCVR series</strong></td>
<td>Panduit clear covers for HTAPs. Must be selected according to HTAP being covered.</td>
</tr>
<tr>
<td><strong>RGS134-1Y</strong></td>
<td>Grounding strip (vertical busbar) for newly installed racks or cabinets with screw rails. 78.65&quot; (2m) length; .67&quot; (17mm) width; .05&quot; (1.27mm) thickness; provided with .16 oz. (5cc) of antioxidant, one grounding sticker and three each #12-24 x 1/2&quot; and M6 x 12mm thread-forming screws.</td>
</tr>
<tr>
<td><strong>RGCBNJ660P22</strong></td>
<td>Jumper kit for bonding individual racks or cabinets into grounding backbone. #6 AWG (16mm²) jumper; 60&quot; (1.52m) length; 45° bent lug on grounding strip side; provided with .16 oz. (5cc) of antioxidant, two each #12-24 x 1/2&quot;, M6 x 12mm, #10-32 x 1/2&quot; and M5 x 12mm thread forming screws and a copper compression HTAP* for connecting to a #6 to #2 awg sized bonding backbone.</td>
</tr>
<tr>
<td><strong>GJ672UH</strong></td>
<td>Rack jumper (and cabinet) kits for smaller TR (5 bays or less) to bond individual rack or cabinet directly back to wall mounted busbar. One 72&quot; length #6 AWG green wire with yellow horizontal stripe. Jumper is pre-terminated on one end with LCC6-14JAWH-L and the other end with LCC6-14JAW-L. This rack grounding jumper is 72&quot; long. For other lengths replace the &quot;72&quot; in the part number. Available lengths are 72, 96, 120, 144, 168, 192, 216, 240, 264 and 288 inches.</td>
</tr>
<tr>
<td><strong>RGESD2-1</strong></td>
<td>Two-hole ESD port with 5/8&quot; hole spacing; provided with an ESD protection sticker, .16 oz. (5cc) of antioxidant, and two each #12-24 x 1/2&quot; and M6 x 12mm thread-forming screws. LOCATE ONE WITHIN REACH OF ALL EQUIPMENT. WORKS WITH WRIST STRAP RGESDWS.</td>
</tr>
<tr>
<td><strong>RGESDWS</strong></td>
<td>Adjustable fabric ESD wrist strap with 6' coil cord, banana plug, 1 megaohm resistor and 4mm snap. LOCATE ONE WITHIN REACH OF ALL EQUIPMENT. WORKS WITH ESD PORT RGESD2-1.</td>
</tr>
<tr>
<td><strong>RGTBSG-C</strong></td>
<td>Green thread-forming bonding screws for use to mount equipment that does not have a built-in grounding pad (terminal).</td>
</tr>
<tr>
<td><strong>RGEJ1024PHY</strong></td>
<td>24&quot; long pre-terminated equipment grounding jumper #10 AWG (6mm²) jumper; bent lug on grounding strip side to straight lug on equipment; provided with .16 oz. (5cc) of antioxidant and two each #12-24 x 1/2&quot;, M6 x 12mm, #10-32 x 1/2&quot; and M5 x 12mm thread forming screws. FOR EQUIPMENT LIKE CHASSIS SWITCHES WITH BUILT-IN GROUNDING PAD (TERMINAL).</td>
</tr>
<tr>
<td><strong>RGEJ1036PFY</strong></td>
<td>36&quot; long pre-terminated equipment grounding jumper #10 AWG (6mm²) jumper; bent lug on grounding strip side to straight lug on equipment; provided with .16 oz. (5cc) of antioxidant and two each #12-24 x 1/2&quot;, M6 x 12mm, #10-32 x 1/2&quot; and M5 x 12mm thread forming screws. FOR EQUIPMENT LIKE CHASSIS SWITCHES WITH BUILT-IN GROUNDING PAD (TERMINAL).</td>
</tr>
<tr>
<td><strong>GB2B0306TPI-1</strong></td>
<td>Wall mounted telecommunications busbar suitable for small telecom room. Pre-assembled with BICS/TIA-607-B hole spacing. Bar is 1/4&quot; x 2&quot; x 12&quot; in size.</td>
</tr>
<tr>
<td><strong>GB2B0514TPI-1</strong></td>
<td>Wall mounted telecommunications busbar suitable for med telecom room. Pre-assembled with BICS/TIA-607-B hole spacing. Bar is 1/4&quot; x 2&quot; x 24&quot; in size.</td>
</tr>
<tr>
<td><strong>GB4B0624TPI-1</strong></td>
<td>Wall mounted telecommunications busbar suitable for main grounding busbar in medium sized facility. Pre-assembled with BICS/TIA-607-B hole spacing. Bar is 1/4&quot; x 4&quot; x 20&quot; in size.</td>
</tr>
<tr>
<td>Panduit</td>
<td>LTYK</td>
</tr>
<tr>
<td>---</td>
<td>---</td>
</tr>
</tbody>
</table>

**NETWORK LABELING SOFTWARE – FOR INK JET/LASER PRINTER**

<table>
<thead>
<tr>
<th>Panduit</th>
<th>PROG-EM2GO</th>
<th>Easy-Mark Labeling Software for PC, supplied on USB Flash Drive. For preprinting communications labels on laser/ink jet printer.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Panduit</td>
<td>S100X150YAJ</td>
<td>Self-laminating cable labels for Category 6 cable for use with Easy-Mark software and laser/ink jet printer.</td>
</tr>
<tr>
<td>Panduit</td>
<td>C261X035Y1J</td>
<td>Patch Panel labels for use with Easy-Mark software and laser/ink jet printer.</td>
</tr>
<tr>
<td>Panduit</td>
<td>C195X040Y1J</td>
<td>Faceplate labels for single gang stainless or slopped plastic - use with Easy-Mark software and laser/ink jet printer.</td>
</tr>
<tr>
<td>Panduit</td>
<td>C288X040Y1J</td>
<td>Faceplate labels for double gang stainless - use with Easy-Mark software and laser/ink jet printer.</td>
</tr>
<tr>
<td>Panduit</td>
<td>S100X650YAJ</td>
<td>Cable label for indoor/outdoor tight-buffered armored fiber optic cable. For use with Easy-Mark software and ink jet printer.</td>
</tr>
<tr>
<td>Panduit</td>
<td>S100X160YAJ and NWSLC-3Y</td>
<td>Label and turn-tell sleeve for labeling fiber jumpers. For use with Easy-Mark software and ink jet printer.</td>
</tr>
<tr>
<td>Panduit</td>
<td>C200X100FJJ</td>
<td>1&quot; high, white, vinyl tape labels for labeling grounding busbars, racks, cabinets and pathways. For use with laser/ink jet printer.</td>
</tr>
</tbody>
</table>

**NETWORK LABELING – HANDHELD LABELER**

<table>
<thead>
<tr>
<th>Panduit</th>
<th>LS8EQ-KIT-ACS</th>
<th>Panduit PanTher hand-held label printing system in kit. Includes LS8EQ printer with QWERTY keypad, one cassette of S100X150VAC self-laminating labels, six AA alkaline batteries, LS8E-ACS, LS8-CASE, LS8-PCKIT, LS8-IB, LS8-WS, quick reference card and operator’s manual. USE FOR LABELS THAT MUST BE PRINTED ON THE JOB SITE.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Panduit</td>
<td>S100X150VAC</td>
<td>Self-laminating cable labels for Category 6 cable for use with PanTher LS8E handheld printer.</td>
</tr>
<tr>
<td>Panduit</td>
<td>C261X035Y1C</td>
<td>Handheld printer labels for modular faceplate patch panels.</td>
</tr>
<tr>
<td>Panduit</td>
<td>C195X040Y1C</td>
<td>Faceplate labels for single gang stainless - use with PanTher handheld labeler.</td>
</tr>
<tr>
<td>Panduit</td>
<td>C288X040Y1C</td>
<td>Faceplate labels for double gang stainless - use with PanTher handheld labeler.</td>
</tr>
<tr>
<td>Panduit</td>
<td>S100X650VAC</td>
<td>Cable label for indoor/outdoor tight-buffered armored fiber optic cable. For use with handheld labeler.</td>
</tr>
<tr>
<td>Panduit</td>
<td>S100X160VAC and NWSLC-3Y</td>
<td>Label and turn-tell sleeve for labeling fiber jumpers. For use with hand-held labeler.</td>
</tr>
<tr>
<td>Panduit</td>
<td>T100X000VPC-BK</td>
<td>1&quot; high, continuous black on white, vinyl tape labels for labeling racks, cabinets and pathways with PanTher LS8E handheld labeler.</td>
</tr>
</tbody>
</table>

**PHYSICAL SECURITY LOCKING DEVICES**

<table>
<thead>
<tr>
<th>Panduit</th>
<th>PSL-DCJB-C</th>
<th>Package of 100 RJ45 jack blockout devices and one removal tool. Color red.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Panduit</td>
<td>PSL-USBA-L</td>
<td>Package of 50 USB Type ‘A’ blockout devices and one removal tool. Color red.</td>
</tr>
<tr>
<td>Panduit</td>
<td>PSL-USBB-L</td>
<td>Package of 50 USB Type ‘B’ blockout devices and one removal tool. Color red.</td>
</tr>
<tr>
<td>Panduit</td>
<td>PSL-DCPLX-BL-C</td>
<td>Package of 100 RJ45 plug lock-in devices compatible with flush mount jacks, and one installation/removal tool. Color black.</td>
</tr>
<tr>
<td>Manufacturer</td>
<td>Item Code</td>
<td>Description</td>
</tr>
<tr>
<td>--------------</td>
<td>-------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Panduit</td>
<td>PSL-DCPLRX-BL-C</td>
<td>Package of 100 RJ45 plug lock-in devices compatible with recessed jacks, and one installation/removal tool. Color black.</td>
</tr>
<tr>
<td></td>
<td>TTS-35RX0</td>
<td>.75&quot; wide, continuous roll Hook and Loop Cable Ties, black. 35 ft. roll. Carton qty 10 rolls.</td>
</tr>
<tr>
<td>Panduit</td>
<td>HLSP1.5S-X12</td>
<td>Plenum rated hook and loop cable ties for air return spaces. Maroon color, perforated at 6&quot; length.</td>
</tr>
<tr>
<td>Panduit</td>
<td>HLSP3S-X12</td>
<td>Plenum rated hook and loop cable ties for air return spaces. Maroon color, perforated at 6&quot; length.</td>
</tr>
</tbody>
</table>

<END OF DOCUMENT>
SECTION 28 13 00
ACCESS CONTROL SYSTEM

PART 1 GENERAL
1.1 RELATED DOCUMENTS
General: Drawings and General Provisions of the Contract, including General and Supplementary Conditions and Special Provisions, apply to this section.

1.2 DESCRIPTION
A. General Description: This specification section covers the furnishing and installation of a complete low voltage Access Control System (ACS).
B. Contractor shall furnish and install security hardware devices, mounting brackets, power supplies, 120VAC branch wiring and conduit, switches, control transformers, controls, consoles and other components of the system as shown and specified.
C. Also furnish and install all outlets, junction boxes, conduit, connectors, wiring, and other accessories necessary to complete the system installation.
D. Products shall be as specified on attached equipment and material cut sheets unless equals approved in advance by Pinal County.
E. The Installing contractor shall include in the scope of work a meeting with owner’s IT representative to review proposed system design, materials, software, and hardware requirements prior to preparation of final shop drawings for Owner’s review and approval.
F. Pinal County has a Velocity server. There is no requirement for a Velocity server or hardware. Any references to such may be disregarded. Software licensing shall be coordinated with the County to confirm licensing for proposed system and devices for a period of two years from substantial completion.

G. Related Work
1. 26 00 00 – Electrical (Division 26)
2. 27 00 00 – Communications (Division 27)

1.4 SHOP DRAWINGS & EQUIPMENT SUBMITTAL
Contractors for each trade shall have an initial meeting with Pinal County IT representative to review project scope of work.

Contractor shall submit a complete set of plans (36” x 24”) in PDF format and hard copy of each system for Owner’s review and approval. Plans shall include bill of materials and cut sheets for all proposed equipment and materials consistent with this specification or equals approved in advance by Pinal County, plan drawings, wiring diagrams, calculations, and details.

1.5 Operations and maintenance manuals
Provide (6) copies of O and M manuals for Owner’s review and approval.

1.6 WARRANTY
Two years from date of substantial completion.

AW 2018.077
Pinal County San Tan Valley Complex
December 4, 2019

Bid Addendum #002
28 13 00- 1
Access Control System
1.7 TECHNICAL REQUIREMENTS, ACCESS CONTROL SYSTEM (ACS)

A. General: The following information is provided to establish required system performance for the complete operating ACS. Contractor shall provide equipment, wiring, and software programming, as necessary, to provide a complete system as described herein and as shown on the drawings.

2. Contractor shall be responsible for providing equipment and software to achieve the specified system performance described herein and, by reference, realize absolute and seamless compatibility with the existing system.

3. Contractor shall ensure that modifications provided under this scope of work have no negative effect on the existing systems and operations, and no permanent effect beyond that specified or implied by the scope of work unless otherwise noted herein.

B. Attributes

2. The system shall comprise Access Control System field devices located as shown on the drawings and connected together to provide a complete and operational system.

3. The ACS shall be based on a distributed system of fully intelligent, stand-alone controllers, operating in a multi-tasking, multi-user environment. Systems that rely on two stage architectures that combine “dumb” remote modules with separate intelligent system controllers are not acceptable.

4. The ACS shall utilize a single seamlessly integrated relational database for all functions utilizing a fully multi-tasking multi-threading Microsoft Operating System and Microsoft SQL Server database.

5. The ACS shall function as an Access Control System and shall integrate alarm monitoring, ID badging and database management into a single platform. A modular and network-enabled architecture shall allow maximum versatility for tailoring secure and dependable access and alarm monitoring solutions.

PART 2 PRODUCTS

The ACS shall be a modular and network-enabled access control system. The ACS shall be capable of controlling multiple remote sites, alarm monitoring, video imaging, ID badging, emailing of events and alarms, digital video and CCTV switching and control that allows for easy expansion or modification of inputs and remote control stations.

2.1 Product Acceptability

The Products section contains lists of acceptable products. If product substitutions are proposed, they must be made based upon a comparison of equivalence to the product specified. Considerations may include but shall not be limited to functional, physical, aesthetic and/or interface aspects. CLIENT shall be the sole judge of whether or not a submitted substitution is deemed to be "equivalent" to that specified.

2.2 Access Control Equipment

- System: Identiv Velocity Security Management System. Coordinate all work with Owner and the County’s existing access control server and software licensing. Provide components per the attached cut sheets or Owner’s prior approved equals.

- System Controller Panels: Provide sufficient controllers and input/output boards to meet all requirements of specifications.
  - ACS Controller: Where new controllers are required provide the following;
Intelligent multi door Controller, compatible with the ACS application software, with a flash ROM module, power supply, battery standby, and Communications Module, as described herein.

PoE+ Intelligent Controller option: A single door controller that can operate on PoE+ power input or 12VDC and 24VDC. Controller shall support 1 door with ENTRY and EXIT readers via Wiegand or OSDP RS485 communications. The door relay shall be a dry output utilizing external lock power, or optionally through onboard settings provide “wet” 12 VDC voltage output for powering a lock with a current rating the meets the power budget available.

Contractor shall review drawings and specifications with the Project Representative, and may propose changes to the topology of the system based on device layout, where such changes improve performance or functionality of the system. CLIENT has final authority as to the final approach for system topology.

Reader Support: Controller shall be configurable for 2, 4, or 8 doors, supporting readers for ENTRY and EXIT at all doors. Enclosure, controller board, and accessories shall be the same for 2, 4, or 8 reader configuration for consistency in system hardware layout. Controllers shall be field upgradeable from 2 to 4 to 8 doors through firmware upgrade.

Provides Boolean logic functions for input/output points for primary and downstream controllers without need for host server.

Dedicated encryption processor to enable PKI based certificate level encryption between controllers and host server. Encryption shall also include encrypted communication to readers with embedded encryption processor.

The controller shall have integrated network communications with onboard Ethernet port.

High security supervised alarm points.

Configurable output relays.

Expansion capability within standard controller enclosure footprint:
- Memory up to 132,000 users
- 8-input Alarm Expansion Boards – up to 4
- 8-output Relay expansion boards – up to 5

Controllers shall be capable of upgrading the firmware through the ACS head-end without requiring the need to access each controller to upgrade the firmware.

The controller shall support Entry and Exit readers at all controlled doors, using dual reader interface boards, wiegand or RS485 cabling.

Readers connected to the controller over the reader interface board or RS485 connections may be installed up to 1200 feet from the controller.

CODE/Buffer: The controller shall be capable of expanding the CODE database up to a maximum of 132,000 Users with the addition of a memory expansion board. The board shall be mounted in the controller cabinet and connect to the controller board via an expansion bus cable.

Event Transaction Buffer: The controller shall be capable of expanding the event transaction buffer up to a maximum of 20,000 events and 2,000 alarms with the addition of a memory expansion board. The board shall be mounted.
in the controller cabinet and connect to the controller board via an expansion bus cable.

- Controllers shall utilize flash downloadable firmware that may be updated from the server as manufacturer updates are released.

- Controller General Features: The software for the controller shall reside in Flash ROM (firmware) and be located on a plug removable module on the controller board to facilitate easy field upgradeability of the features. All of the necessary software for a fully functional System is located in the controller. The controller firmware shall be fully supported by the ACS head-end, and include the following general features at a minimum:
  - 3 - 15 digit keypad Codes.
  - Duress digit for keypad Codes.
  - 150 Time Zones for access restriction and automatic event control.
  - 128 Access Zones for access management.
  - 256 Control Zones for alarm and relay management.
  - 366 programmable holidays this year, 366 days next year. Each Holiday may be assigned to 1 - 4 Holiday Schedules.
  - Automatic daylight savings time clock adjustment.
  - 27 different functions for Codes and cards, such as access, unlock, re-lock, alarm mask, and relay control.
  - Add user records.
  - Tag users for annunciation at host computer.
  - 4,000 Users.
  - 1500 event, 1500 alarm transaction buffer

- Access Control Features: The controller shall include the following access control features at a minimum
  - Restrict access by: time of day; day of week; door; holiday.
  - Momentary Access of door up to 8100 seconds.
  - Extended Access for User Definable Momentary Access duration (requires ScramblePad). ScramblePad will display time remaining on the minute, and annunciate at the defined "Warning Time".
  - Special Needs Time Extension to provide additional time for Momentary Access and Door Open Too Long for selected people.
  - Unlock/Re-lock of door by CODE, card, or Time Zone.
  - Door status monitoring shall allow for: door forced monitoring; door-open-too-long monitoring; door-open-too-long while door is unlocked; and auto-re-lock of door when opened or closed.
  - Request-to-exit masks alarm and/or unlocks door.
  - 2 person requirement by door. A user can be defined as Normal, A/B Rule A, A/B Rule B, or Executive Override. Can be disabled by Time Zone.
  - 63 Passback Zones. Can be disabled by Time Zone. A User can be designated with Passback Executive Override.
  - Use Count limits on users.
  - Absentee Rule limits on users.
  - Temporary Day limits on users.
  - Occupancy Counting / Minimum & Maximum limits per Passback Zone.
Deadman CODE / Timer.

Threat Levels – 99 Levels may be defined. Based on the Level in effect for the facility, selected readers may be disabled, dual readers in Card/Code Only During Time Zone can require dual, and selected User's Credentials can be disabled.

Timed Anti-Passback

Alarm Management Features: The controller shall include the following alarm management features at a minimum:

- Momentarily mask alarm by CODE and/or card.
- Mask/unmask alarm by CODE and/or card or by Time Zone.
- Alarm device supervised while masked.
- Tamper switch on alarm device monitored while masked.
- Tamper Input may be configured to operate as a “Latch Monitor” with the appropriate door lock hardware.
- Entry/Exit delay per alarm input.
- Alarm input triggers relays

Relay Control Features: The controller shall include the following relay control features at a minimum:

- CODE and/or card, input, or other relay triggers relays.
- Trigger relays by time zone.
- Relay may be normally de-energized or energized.
- Disable relays during time zone.
- Clear relay at end of time zone

Controller Connectivity

- Controllers shall support connection to the security LAN/WAN using TCP/IP protocol, and shall also support connection to the manufacturer’s standard data communications protocol (RS-232, RS-485, or RS-422).
- TCP/IP-connected controllers may act as a network “gateway”, to re-transmit controller data via the manufacturers standard data communications protocol (RS-232, RS-485, or RS-422), to other ACS controllers located within the same site. Provide controllers which support the manufacturer’s standard data communications protocol, RS-232/RS-485, as required.
- LAN/WAN Interface Board: 10/100/1000 Mbps interface with 256-bit FIPS140-2 AES encryption.

Reader Connections: Controllers communicate with readers in the following ways, depending upon readers used, distance and wiring conditions:

- Direct wiegand cabling and data to the main controller board
- MATCH2 reader interface connections, which provide extended distances (up to 1500 feet between interface and controller), support for mag stripe data formats, exit reader capability at a single door using wiegand output readers and hash encryption of card data between MATCH interface and controller.
- RS485 OSDP communications between OSDP readers and controller. Supports Entry and Exit readers at doors, extended distances and card data encryption between reader and controller

Alarm Inputs: The controller shall monitor the status of all doors it controls, and be capable of accepting up to 32 additional supervised alarm inputs, in increments of
eight (8). The sensitivity of the line supervision shall be 2% AA with appropriate alarm line modules. The alarm expansion boards shall be mounted in the controller cabinet and connect to the controller board via an expansion bus cable.

- **Relay Output:** The access control controllers shall be capable of accepting up to 32 additional Form C, 2 Amp rated relay outputs in increments of 8. These outputs shall be used for control applications other than standard door access, such as elevator floor control, local door annunciators, HVAC interface, etc. The relay expansion boards shall be mounted in the controller cabinet and connect to the controller board via an expansion bus cable.

- **Controller Power Supply:** Controllers shall include an internal panel supply provided by the controller manufacturer and sized to support the controller requirements. Systems that require external supplies or plug-in transformers are not acceptable.

- **Battery Back-up:** Controllers shall be equipped with internal UPS battery systems to operate the controller and maintain controller programming in the event of a power failure. Power and UPS systems shall be monitored by the system, generating alerts when power is lost, power is restored, and when UPS systems are running low.

- **Controller Tamper Switch:** Provide a tamper switch on the Controller enclosure. Connect to the system as an individual alarm point.

- **Terminations:** Provide all connections to labeled screw barrier terminal blocks.

- **Secure all devices within the Controller enclosure. Dress all wiring in a neat and competent manner. Label all conductors to match documentation.**

- **Card Readers and Authentication Devices:** The controllers shall support a variety of authentication devices, including card readers, keypads, scramble keypads and biometric devices, including multi-frequency contactless card reader(s) shall be designed to securely read, decipher, and authenticate user card data from 13.56 MHz and 125 kHz proximity cards.

- **Controllers shall support readers that communicate to the controllers via wiegand data format (26-200 Bits), clock and data and RS485 OSDP formats.**

- **Supported reader technologies include magnetic stripe readers, wiegand, low frequency proximity, high-frequency secure contactless smart card and biometric technologies including fingerprint, hand geometry, vein pattern, iris and facial recognition.**

- **Controllers shall support Entry and Exit readers at each door controlled without sacrificing door capacity.**

- **Supports programming and re-flashing through RS-485 data protocol or over TCP/IP**

- **ScramblePad Digital Keypad:** The controller shall be capable of using scrambling keypad readers. The keypad shall incorporate the following features:
  - Scrambling display of numbers 0 - 9 (numbers appear in different location every time it is used); +/- 4 degrees horizontal and +/- 26 degrees vertical viewing restriction; accept 3 - 15 digit CODEs simultaneously; be disabled for 1 minute and report CODE Tamper violation (guessing CODEs); be disabled and report Physical Tamper violation (attempt to remove keypad from mounting box); silent CODE duress; status LEDs for reporting granted, denied, and overridden transactions, AC Fail, Programming Mode active, responses to Status Request of Alarm Inputs and Relay Outputs; weather-resistant; supervised by controller; and built-in diagnostics. The ScramblePad
shall include the MATCH Universal Reader Interface functionality enabling Entry and EXIT control.

- A version of the scrambling keypad shall be available for use in high ambient lighting conditions, or where the front is subject to direct sunlight. This version shall have a +/- 12 degrees horizontal and +/- 26 degrees vertical viewing restriction.
- Scrambling keypads shall be available with an integrated internal contactless card reader, which support card, PIN and dual card and PIN authentication models. Internal readers can be low frequency (125KHz) proximity, 13.56 MHz contactless smart card, or both.
- A version of the scrambling keypad with high intensity display shall be available with an integrated Indala compatible proximity card reader. Presentation of the card shall automatically auto-start the scrambling display.

Part 3 - EXECUTION

3.1 GENERAL

A. The Contractor shall install system components and appurtenances in accordance with the manufacturer's instructions, and as shown. The Contractor shall furnish necessary interconnections, services, and adjustments required for a complete and operable system as specified and shown.

B. Installation: The Contractor shall install the system in accordance with the standards for safety, NFPA 70, UL 681, UL 1037 and UL 1076, and the appropriate installation manual for each equipment type. Flexible cords or cord connections shall not be used to supply power to any components of the system, except where specifically noted. All other electrical work shall be as specified in Division 26, and as shown.

3.2 EQUIPMENT, RACK AND CONSOLE INSTALLATION

Mount equipment in rooms, consoles, equipment racks, and desktops as coordinated with Owner.

3.3 GROUNDING PROCEDURES

Provide grounding of all systems and equipment per Division 26 requirements.

3.4 WIRE AND CABLE INSTALLATION PRACTICES

A. Wiring Method: Install wiring in raceway and cable tray except within consoles, cabinets, desks, and counters and except in accessible ceiling spaces and in gypsum board partitions where unenclosed wiring method may be used. Use NRTL-listed plenum cable in environmental airspaces, including plenum ceilings. Conceal raceway and cables except in unfinished spaces.

3.5 DATABASE PREPARATION, CHECKING AND ACTIVATION

Provide database preparation, checking, and activation.

3.6 START-UP RESPONSIBILITY

Provide start-up services for all systems and equipment.
3.7 SYSTEM PERFORMANCE TESTING AND ADJUSTING PROCEDURES

A. Provide Preliminary Testing, Inspection, Performance Verification Testing, Commissioning and Endurance Testing services for ACS systems and equipment.

B. Access Control System Testing
   2. Test and verify the normal operation of every alarm point in all states at each alarm panel – normal, alarm (forced entry), door propped, noisy, short, out-of-spec, tamper. Test each alarm point for the alarm function by normal operation of the alarm point, i.e.: for a door position switch, open the door and so forth.

   3. Test and verify the operation of the Electronic Access Control and Intrusion Detection System.

   4. Test each door during its programmed secure time period to assure that it commands the lock to activate and permits access by valid credential within one second from presentation of the key.

   5. Verify all egress systems on access controlled doors work correctly.

   6. Verify system integration schemes function automatically and correctly.

   7. Verify all activity at Monitoring Stations functions correctly.

(END OF SECTION)
SECTION 28 23 00

VIDEO SURVEILLANCE

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes a video surveillance system consisting of cameras, data transmission wiring connected to owners network, mounting hardware, software licenses, and training.

B. The Installing contractor shall include in the scope of work a meeting with owner's IT representative to review proposed system design, materials, software, and hardware requirements prior to preparation of final shop drawings for Owner's review and approval.

C. Provide and install (1) Ocularis/OnSSI server and associated software licensing. Pinal County owns the Enterprise version of ONSSI Ocularis. The GC will need to include an Ocularis camera license for each camera supplied by GC.

D. Provide Axis cameras and devices per the attached cut sheets or prior Owner approved equals. In addition to any other requirements, cameras supplied by the GC will need to be compatible with Ocularis. Camera compatibility can be checked at this web site https://onssi.com/supported-devices-50/. Cameras that only support ONVIF driver will not be accepted.

1.2 DEFINITIONS

AGC: Automatic gain control.

BNC: Bayonet Neill-Concelman - type of connector.

B/W: Black and white.

CCD: Charge-coupled device.

FTP: File transfer protocol.

IP: Internet protocol.

LAN: Local area network.

MPEG: Moving picture experts group.

NTSC: National Television System Committee.

ONVIF: Open Network Video Interface Forum

PC: Personal computer.

PSIA: Physical Security Interoperability Alliance
PTZ: Pan-tilt-zoom.

RAID: Redundant array of independent disks.

SIA: Security Industry Association

TCP: Transmission control protocol - connects hosts on the Internet.

TVAC: SIA CCTV Access Control Standard

UPS: Uninterruptible power supply.

WAN: Wide area network.

The term “Provided By Others (PBO)” shall refer to material and work which is not in the contract and for which the Contractor is not responsible except as otherwise detailed in the specifications, plans or contract documents.

The term “Owner Furnished Equipment (OFE)” shall refer to material or equipment that shall be provided by the “Owner” of the facility. The Contractor shall be responsible for installation and integration of this equipment as detailed herein.

The term “Customer” or “Owner” shall refer to the owner of the facility for which the work and materials are being provided.

The term “shall” is mandatory; the term “will” is informative; the term “should” is advisory; and the term “provide” means to furnish and install.

The term “Installer or Security or Video Surveillance Contractor” refers to the successful vendor/installer or subcontractor if under the General Contractor contract vehicle.

The term “Consultant” refers to the agency or firm that is contracted with the Owner to provide engineering design and contract inspection services for all security video equipment and materials to be utilized or specified in these contract documents.

The term “Bidder” refers to a qualified Contractor or firm intending to tender a bid on the systems described herein.

The term “Construction Manager” or “GC” refers to the representative responsible for the general building construction and on-site coordination and management of all subcontractors.

1.3 PERFORMANCE REQUIREMENTS

A. Design Standards

The customer's goal is to have available the most commonly used Video Surveillance equipment as a cohesive system. Therefore, part of the development efforts for successfully implementing the Video Surveillance systems should include:

Installing the system in a manner that will comply with B1CSI, IEEE, PSIA, SIA and routing all video and control cabling elements of the final design in a subtle, unobtrusive manner to maintain the architectural and visual integrity of the building.
Except where plenum cable is used above finished ceilings, it is required that cabling for video line inputs, wideband RGBHV video, and other A/V-related cabling be routed inside the comprehensive system of conduit indicated on Drawings and installed by the “GC”. Floor and wall boxes shall serve as the primary interface points to the A/V and Video Surveillance systems.

Provide low voltage transformers within 40 feet of associated video camera location that shall receive AC power from above finished ceiling or frame an associated equipment rack.

Provide any necessary signal repeaters/amplifiers for any control signals running a distance greater than 50 feet or in excess of the signals standard specification for distance.

Provide and install security covers on any electronics with front panel controls that should not need to be adjusted after initial set-up. All components permanently mounted to rack rail systems shall be installed with industry accepted security screws. Each instructor's station shall include a 4 inch low-noise fan unit.

B. Performance Standards

Unless restricted by the published specifications of a particular piece of equipment, or unless otherwise required, the following minimum performance standards shall be met by each system:

<table>
<thead>
<tr>
<th>Video (Signal)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>S/N (peak to RMS) unweighted DC to 4.2MHz</td>
<td>45 dB minimum</td>
</tr>
<tr>
<td>Crosstalk, unweighted DC to 4.2MHz</td>
<td>45 dB minimum</td>
</tr>
<tr>
<td>Frequency Response (composite)</td>
<td>Within +0.5 dB to 10MHz</td>
</tr>
<tr>
<td>Line and Field Tilt</td>
<td>2 percent Maximum</td>
</tr>
<tr>
<td>Differential Gain</td>
<td>3 percent Maximum</td>
</tr>
<tr>
<td>Differential Phase</td>
<td>2 degrees Maximum</td>
</tr>
<tr>
<td>Termination Impedance</td>
<td>75 ohm</td>
</tr>
</tbody>
</table>

Performance Test Signal Paths: The signal paths for the above Performance Standards shall be as follows:

Video: From all source inputs (for cameras, computers, video tape units, DVD Players, etc.) through all distribution amplifiers (VDA), processors, switchers, routers, etc., to all signal destinations.

Remote Control Standards: As a minimum, the remote control system for each area shall be programmed to include the following:

- PTZ Presets - Activate a minimum of three (3) presets for each installed remote controllable video camera.
- Full function control of all source components, display units, processing and switching electronic devices.
- Automatic System Shutdown
- Camera or electronic device IP Address
- Per function status feedback indicating active/passive modes of operation and current settings.

1.4 ACTION SUBMITTALS (additional requirements)

A. Product Data: For each type of product indicated. Include dimensions and data on features, performance, electrical characteristics, ratings, and finishes.

B. Shop Drawings: For video surveillance. Include plans, elevations, sections, details, and attachments to other work.
   1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
   2. Functional Block Diagram: Show single-line interconnections between components for signal transmission and control. Show cable types and sizes.
   3. Dimensioned plan and elevations of equipment racks, control panels, and consoles. Show access and workspace requirements.
   4. UPS: Sizing calculations.
   5. Wiring Diagrams: For power, signal, and control wiring.

C. Equipment List: Include every piece of equipment by model number, manufacturer, serial number, location, and date of original installation. Add pretesting record of each piece of equipment, listing name of person testing, date of test, set points of adjustments, name and description of the view of preset positions, description of alarms, and description of unit output responses to an alarm.

D. Operation and Maintenance Data: For cameras, power supplies, infrared illuminators, monitors, videotape recorders, digital video recorders, video switches, and control-station components to include in emergency, operation, and maintenance manuals. Include the following:
   1. Lists of spare parts and replacement components recommended to be stored at the site for ready access.

1.5 QUALITY ASSURANCE (additional requirements)

Demonstrate at least three (3) years of experience in the fabrication, programming, assembly, installation, integration and testing of audio-visual presentation and remote control systems of similar magnitude and quality as specified for this contract. The Contractor shall submit documentation to the effect with the bid return, including three (3) references (below).

References: Furnish no less than three (3) references for installations of similar size (dollar amount and quantity of floor space receiving integrated technology) and scope, performed throughout the Continental United States within the last three years. At a minimum, reference data shall include the reference company, institute or agency name, contact person's name and title, telephone number, address, email address and detail project description. Additionally, the reference data shall provide the name of the person that is in charge of the day-to-day operation of the audio-visual installation, with phone number.
Additionally, the following shall be adhered to:

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Comply with NECA 1.

C. Comply with NFPA 70.

D. Electronic data exchange between video surveillance system with an access-control system shall comply with SIA TVAC.

1.6 PROJECT CONDITIONS

A. Environmental Conditions: Capable of withstanding the following environmental conditions without mechanical or electrical damage or degradation of operating capability:

1. Control Station: Rated for continuous operation in ambient temperatures of 25 to 110 deg F and a relative humidity of 20 to 90 percent, non-condensing.

2. Interior, Controlled Environment: System components, except central-station control unit, installed in air-conditioned interior environments shall be rated for continuous operation in ambient temperatures of 32 to 120 deg F dry bulb and 20 to 90 percent relative humidity, non-condensing. Use NEMA 250, Type 1 enclosures.

3. Interior, Uncontrolled Environment: System components installed in non-temperature-controlled interior environments shall be rated for continuous operation in ambient temperatures of 0 to 120 deg F dry bulb and 10 to 90 percent relative humidity, non-condensing. Use NEMA 250, or Type 3R enclosures.

4. Exterior Environment: System components installed in locations exposed to weather shall be rated for continuous operation in ambient temperatures of -4 to plus 140 deg F dry bulb and 10 to 95 percent relative humidity, condensing. Rate for continuous operation when exposed to rain as specified in NEMA 250, winds up to 85 mph and snow cover up to 14 inches thick. Use NEMA 250, Type 3, Type 3R, Type 4 or Type 4X enclosures.

5. Hazardous Environment: System components located in areas where fire or explosion hazards may exist because of flammable gases or vapors, flammable liquids, combustible dust, or ignitable fibers shall be rated, listed, and installed according to NFPA 70.

6. Corrosive Environment: System components subject to corrosive fumes, vapors, and wind-driven salt spray in coastal zones. Use NEMA 250 or Type 4X enclosures.

7. Security Environment: Camera housing for use in high-risk areas where surveillance equipment may be subject to physical violence.

1.10 DELIVERY, STORAGE, AND HANDLING

The Contractor shall supply, transport, deliver, unload, move to the installation location, unpack, place, assemble, secure or mount, connect and install all equipment required to complete the installation of the audio-visual system. The Contractor shall be responsible for transportation, delivery, and on-site stage of the system’s equipment and materials. The Contactor shall be responsible for all transportation of personnel, tools, and all required support or test equipment to and from the site.

The Customer/Owner’s acknowledgement of delivery of goods or materials shall not constitute Acceptance (partial or otherwise) and shall not diminish the Contractor’s obligations as specified in the

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Bid Addendum #002
28 23 00- 5
Video Surveillance
contract documents.

1.11 STAGING

Installation shall commence immediately upon delivery of materials to the jobsite, except as directed by Contractor. Time required from delivery date to completion of project shall be in accordance with the approved schedules.

1.12 WARRANTY

B. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of cameras, equipment related to camera operation, and control-station equipment that fail in materials or workmanship within specified warranty period.

1. Warranty Period: **Two years** from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 SYSTEM REQUIREMENTS

A. The complete Security CCTV Video Surveillance system shall be IP based. Cameras shall be manufactured by Axis Communications.

B. System shall provide high-quality delivery and processing of IP-based video, audio, and control data using standard Ethernet-based networks. The System shall have seamless integration of all video surveillance and control functions. Graphical user interface software shall manage all IP-based video matrix switching and camera control functions, two-way audio communication, alarm monitoring and control, and recording and archive/retrieval management. IP system shall also be capable of integrating into larger system environments.

System design shall include all necessary compression software for high-performance, dual-stream, H.264, MPEG-2, MPEG-4 video. Units shall provide connections for all video cameras, camera PTZ control data, bidirectional audio, discreet sensor inputs, and control system outputs.

All camera signals shall be compressed, encoded, and delivered onto the network for processing and control by the IP video-management software.

Encoder/decoder combinations shall place video, audio, and data network stream that can be managed from multiple workstations on the user's LAN or WAN.

All system interconnect cables, workstation PCs, PTZ joysticks, and network intermediate devices shall be provided for full performance of specified system.

C. Video-signal format shall comply with NTSC standard, composite interlaced video. Composite video-signal termination shall be 75 ohms.
D. Surge Protection: Protect components from voltage surges originating external to equipment housing and entering through power, communication, signal, control, or sensing leads. Include surge protection for external wiring of each conductor's entry connection to components.


E. Tamper Protection: Tamper switches on enclosures, control units, pull boxes, junction boxes, cabinets, and other system components shall initiate a tamper-alarm signal when unit is opened or partially disassembled. Control-station, control-unit alarm display shall identify tamper alarms and indicate locations.

2.2 STANDARD IP CAMERAS

A. Manufacturers: Subject to compliance with requirements, provide products by the following manufacturer offering products that shall be incorporated into the Work include, but are not limited to, the following:

B. Basis-of-Design Product: Subject to compliance with requirements, provide Axis IP cameras as described below and per the attached cut sheets or prior Owner approved equal.

C. Mini Fixed Dome Color Camera

1. Comply with UL, FCC and CE as well as standards of ONVIF and PSIA.
2. Pickup Device: 1/4 inch CMOS, 3Megapixel 640(H) by 480(V) pixels @ 30fps.
3. Lens: 4mm, F1.2 Vari-focal lenses
4. Video Compression: H.264, Mpeg4, Mjpeg (32Kbps-8Mbpbs)
5. Ingress Protection: IP66
6. Vandal Proof: IEC60068-2-75Eh,50J;EN50102, exceeding IK10 (Impact Protection Rating)
7. Three-way Axis Gimbal
8. Sensitivity: Camera shall deliver 1-V peak-to-peak video signal at the minimum illumination of 0.1 Lux (Color) or 0.01 Lux (B&W).
9. Automatic backlight compensation or normal lighting and automatic white balance.
10. Synchronization: Internal
11. Input Voltage: DC 12V / PoE, 250mA, 3Watt Maximum
12. Motion Detector: Built-in digital.
13. Enclosure shall be Aluminum/Zinc with a polycarbonate dome and shall be 3.94 x 3.84 x 1.83 inches and not exceed 0.55 pounds.
14. Communications over RJ-45 Ethernet
15. Axis Q3515-LV or equal

D. IP PTZ Dome Color Camera: Assembled and tested as a manufactured unit, containing dome assembly, color camera, motorized pan and tilt, zoom lens, mounting bracket, and receiver/driver.

1. Comply with UL, FCC and CE regulations
2. Pickup Device: CCD interline transfer, 1/4 inch progressive scan, 540 TVL (768(H) by 494(V)) resolution
3. Sensitivity: Day - 0.4 Lux @ f1.2 --- Night - B&W 0.05 Lux @ f1.2
4. Frames per second: NTSC 30 FPS
5. Video Output: 32K ~ 2M (8 Mbps max).
6. Focal Length: 3.4 ~ 119mm --- Varifocal: 35X Optical zoom / 12X digital zoom.
7. Aperture: f1.2 and Auto Iris
8. Compression Type: H.264 dual stream and shall utilize the TI Davinci hardware compression.
9. Protocol supported: TCP/IP, HTTP, DHCP, DNC, RPT/RTCP, PPPoE
10. The IP PTZ camera shall provide video motion detection, Audio detection, alarm input/outputs, PTZ, and SD card local storage.
12. Multiple connection ports to support composite (analog) and IP (RJ-45) digital signals. The single channel H.264 video compression (real-time) will also have a single channel of audio compression and 1 BNC output connector for analog video. The composite video signal shall be 1 Volt P-P and 75 ohm.
13. The unit shall be vandal proof and weather proof and shall provide Ingress Protection (IP66).
14. Power shall be 24VAC with a current draw of 500ma ~ 2A and a maximum power dissipation of 50 Watts and shall weight no more than 9 1/2 pounds.
15. Axis Q3515-LV or equal

E. Megapixel PTZ Color Dome Camera: Assembled and tested as a manufactured unit, containing dome assembly, color camera, motorized pan and tilt, zoom lens, mounting bracket, and receiver/driver.

1. Comply with UL 639.
2. Pickup Device: 1/3inch Progressive scan CCD interline transfer, 1.3Megapixel (1280(H) by 960(V)) resolution and shall utilize Texas Instruments DSP technology.
3. True day/night with built-in IR cut filter.
4. Dual H.264 Compression scheme.
5. Sensitivity: Day - Color 0.1 Lux @ f1.6 / Night - B&W 0.01 Lux @ f1.6.
6. Frames per second: 30 FPS (1280 x 720) / 12.5 FPS (1280 x 960) / 30 FPS 704x480.
7. Video Output: 32k ~ 2M (8Mbps max) or Composite Signal 1Volt P-P 75 ohm.
8. Focal Length: 4.7 ~ 84.6mm, Varifocal 18X zoom.
9. Aperture: f1.6 with Auto Iris
11. Preset Positioning: Eight user-definable scenes, each allowing 16-character titles. Controls shall include the following:
   a. In "sequence mode," camera shall continuously sequence through preset positions, with dwell time and sequencing under operator control.
   b. Motion detection shall be available at each camera position.
   c. Up to four preset positions may be selected to be activated by an alarm. Each of the alarm positions may be programmed to output a response signal.
12. Multiple connection ports to support composite (analog) and IP (RJ-45) digital signals. The single channel H.264 video compression (real-time) will also have a single channel of audio compression and 1 BNC output connector for analog video. The composite video signal shall be 1 Volt P-P and 75 ohm.
13. The unit shall be vandal proof and weather proof and shall provide Ingress Protection (IP66).
14. Protocol supported: TCP/IP, HTTP, DHCP, DNC, RPT/RTCP, PPPoE (FTP, SMTP, NTP, SNMP addible)
15. The IP PTZ camera shall provide video motion detection, Audio detection, alarm input/outputs, PTZ, and SD card local storage.
16. Power shall be 24VAC with a current draw of 500ma ~ 2A and a maximum power dissipation of 30 Watts (w/Heater/Blower) and shall weight no more than 11 1/2 pounds.
17. Axis or equal.

F. Fixed IP Box camera with Housing and Mount: Assembled and tested as a manufactured unit, containing color camera, zoom lens, outdoor housing, mounting bracket, and receiver/driver.

1. Pickup device: 1/3 inch Progressive Scan CCD sensor with 1.3 Megapixel (1280(H) X 960(V)) resolution and shall utilize Texas Instruments DSP technology.
2. True Day/Night with built-in IR cut filter
3. Dual H.264 compression stream (RJ-45 digital output and BNC Analog output)
4. ONVIF compliant
5. ePTZ support
6. Sensitivity: DAY - color 0.1 Lux @ f1.2 / NIGHT - B&W 0.01 Lux @ f1.2
7. Frames Per Second: NTSC 15 FPS (1280 x 960), 30 FPS (1280 x 720)
8. Video Output: 32K ~ 32Mbps (digital) and Composite 1Volt P-P, 75 ohm.
9. Lens Focal Length: 2.8 ~ 12mm, f1.2 with auto iris
10. Audio support (2-way).
11. The IP fixed camera shall provide video motion detection, audio detection, alarm input/outputs, SD card local storage (up to 32Gb).
13. Camera Housing: Weatherproof and IP66, with internal heater/blower for 24VAC operation @ 500mA.
14. Camera Mounting bracket shall be for wall mount and shall be capable of supporting up to 22 pounds. Bracket shall be made of steel and shall have the ability to swivel up to 90 degrees.
15. Camera housing and the fixed megapixel camera weight shall not exceed 3.7 pounds.
16. Axis #Q3517-LVE with wall mount bracket or equal.

2.3 THERMAL IMAGING CAMERAS

A. Manufacturers: Subject to compliance with requirements, provide products from the following manufacturer that may be incorporated into the Work:

B. **Basis-of-Design Product:** Subject to compliance with requirements, provide Axis products per the cut sheets attached to this specification or prior Owner approved equal.

C. Thermal Imaging Camera: The TI Camera shall provide the ability to detect threats in zero visibility conditions. The TI Camera shall have the ability to detect minutes heat signatures at long ranges in complete darknexx and even through smoke or fog. Attributes as follows:

1. Fourth generation of uncooled focal array VOx microbolometer.
2. 640 x 480 Pixels
3. Spectral range shall be 7.5 to 13.5 uM.
4. Lens shall be 6 mm to 250 mm.
5. Field of view: 61° x 46○ to 1.4° x 1.1°.
6. Minimum Illumination: DAY -Color 0.1 Lux @ f1.4/NIGHT - B/W 0 Lux @ f1.4
7. Maximum detection range: Vehicle 11.9 miles, Human being 7.2 miles.
8. Image Processing: Digital detail enhancement (DDE) with AGC.
9. Electronic zoom: 2X
10. Noise equivalent temperature difference: 50mK
11. Field of regard: Rotate 355° horizontally, up/down vertically +6° ~ 90°.
15. Video Output: Composite 1Volt P-P, 75 ohm
16. Operating temperature -13°F ~ 131°F
17. Shall meet MIL-Std-810E for rain, sand/dust, shock and vibration
18. Ingress Protection rating: IP66
19. Input voltage 24VAC with power consumption of 60~170 Watts, weight not to exceed 10 pounds
20. Video encoder: Convert Analog video to H.264 IP up to 30FPS. Shall provide 1 channel of audio with the video (720x480) and support local SD Card storage.
21. Axis camera or equal.

2.4 MONITORS

A. Manufacturers: Subject to compliance with requirements, provide products from the following manufacturer that may be incorporated into the Work:

B. Basis-of-Design Product: Subject to compliance with requirements, provide AsusTek Computer Inc. Attributes as follows:

C. Color:
1. Screen Size shall be 24.1 inches (Diagonal) with a 16:10 aspect ratio
2. Resolution: 1920 x 1200, pixel pitch 0.270mm
3. LED backlight technology
4. Professional-grade color fidelity with pre-calibrated ∆E <5 for industry leading color accuracy.
5. 5-way navigation key for enhanced productivity
6. Ports: (signal input) DVI-D, HDMI, D-Sub, DisplayPort / Audio Output HDMI 1.3 and Earphone jack (3.5mm mini-jack) and 1 x upstream & 4 x downstream USB ports.
7. Picture-in-picture and Picture-by-picture, with quick-fit modes.
8. HDCP support.
9. Brightness (Max): 300 cd/m²
10. Contrast: 8000000:1
11. Viewing angle: 178° (H & V)
12. Response time: 6ms (Gray to Gray)
13. Analog/Digital Signal Frequency: 30~83kHz(H) /50-76Hz (V)
14. Electrical: 100-240VAC with Power Consumption of <75 Watt (operation), Power saving mode: ≤ 1W and Power Off mode: 0W (hard switch)
15. Asus PA248Q or equal.

2.5 NETWORK VIDEO RECORDERS

A. Manufacturers: Subject to compliance with requirements, provide products from the following manufacturer that may be incorporated into the Work:

B. Basis-of-Design Product: Subject to compliance with requirements, provide Ocularis/OnSSI Recorder/Storage Servers. The NVRSS is an enterprise storage solution which can provide up to 48 TeraBytes of Hard Disk storage in an RAID 5 configuration. Attributes as follows:
1. High performance, real-time, fault tolerant, and redundant operating system with hyperthreading dual redundant CPUs.
2. Unit Supports TCP/IP (ARP, RARP, IP, ODP, TCP, PPP, PPPoE, DHCP, SNMP, etc)
3. Remote viewing of one or more channels
4. Supports embedded web server. Browser can be used to access NVR remotely and also supports NVR remote upgrading.
5. Video and audio recording over TCP/IP network.
6. Video recording of H.264, MPEG-2 and MPEG-4 streams.
7. Video recording up to 48 TB for internal storage.
8. Ports: Two RJ-45 (10/100/1000 Ethernet), one RS-232 and 6 - USB ports
10. Continuous and alarm-based recording.
11. Full-Featured Search Capabilities: Search based on camera, time, or date.
12. Automatic data replenishment to ensure recording even if network is down.
14. Internal RAID 5 storage (may be configured for other storage scenarios as requested).
15. Capable of adding external RAID storage up to 7000 GB for models with no internal storage.
16. Full integration with LAN, Intranet, or Internet through standard Web browser or video management software.
17. Integrated Web server FTP server functionality.
18. Size: three (3) RU for standard 19-inch rack mount, weight (loaded) 100 pounds.

2.6 VIDEO MOTION SENSORS (INTERIOR)

A. Manufacturers: Subject to compliance with requirements, provide products from the following manufacturer that may be incorporated into the Work:

B. Basis-of-Design Product: Subject to compliance with requirements, provide motion sensors per attached cut sheets or as prior approved by Owner. Attributes as follows:

360° Ceiling Mount Passive Infrared Detector
1. Passive Infrared detector zoom
2. Coverage: Ø18m (Ø60ft), 360°
3. Ceiling Height: 8 to 16 feet
4. Detectable Speed: 1 - 6ft/second
5. Sensitivity: 1.6°C (3°F) at 2ft/sec.
6. Alarm Output: NC, 28VDC 0.2A max.
7. Warm-up Period: Approximately 20 seconds (LED blinks)
8. Power input: 6 - 18VDC
9. Alarm Output: Form C 28VDC @ 0.2amp Max
10. Controls:
   a. Size of detection zones (zoom unit settings a through e) 276 zones (360 degrees
   b. Sensitivity of detection of each protected zone.
11. Mounting: standard ceiling mount

Wall Mount Passive Infrared PIR Detector
1. Passive Infrared detector
2. Coverage: Wide 40 ft x 40 ft.
3. Detection Zones: 72
4. Mounting Height: 5 to 8 feet
5. Detectable speed: 1 ~ 5 ft/sec.
6. Alarm Period: 2.5 seconds
7. Alarm Output: N.C. 28VDC 0.2Amp max.
8. Warm-up period: Approximately 30 seconds
9. Power supply: 9.5 ~ 16V DC
10. Mounting Bracket: FA-3

2.7 CLIENT WORKSTATIONS

A. Manufacturers: Subject to compliance with requirements, provide products from the following manufacturer that may be incorporated into the Work:

B. Basis-of-Design Product: Subject to compliance with requirements, provide and install Ocularis/OnSSI server and associated software licensing. The Security video head end equipment shall be configured to be controlled and run from the Client Workstations (CWS). The CWS shall monitor and manage DVR/NVR servers in other locations all on a single screen and provide complete control of the DVR/NVR software, PTZ control, and settings. Further, the CWS will control all playback video and local recordings. The CWS shall be rack mountable (19 inch) and shall not exceed 4 RU (rack units) for vertical mounting height and shall not exceed 52 pounds weight.

The Client Workstation (CWS) shall provide authentication at the frame level on DVR and exported on player. Additionally, the CWS shall provide an encrypted watermark utilizing the AES 128 bit encryption scheme and be court admissible.

C. Attributes as follows:

1. The CWS shall utilize the Intel Core 2 Duo processor with a minimum CPU speed of 2.6 GHz minimum.
2. The CWS shall be provided with a minimum of 2 Gigabytes of DDR2 Ram and shall be equipped with a minimum of 1.5 Terabytes of internal hard disk storage, with the ability to be expanded to a total of 9 TB of internal storage.
3. The CWS shall make use of the ATI Radeon 3650 HD Dual DVI with a minimum of 512MB of video ram.
4. CWS shall be provided with a DVD-RW drive and shall be equipped with a serial port (DB-9) and at least two USB ports.
5. Recording Resolution - 4CIF (704x480), DCIF (528x320), 2CIF (704x240), CIF (352 x 240), QCIF (176x120). Image embedded with date/time information.
6. Recording Rate - Real-time all channels simultaneous (30 FPS/NTSC)
7. Recording Mode: Normal, Motion Detection, Sensor, Pre-Post Alarm/Scheduled, Multi-channel.

2.8 SIGNAL TRANSMISSION COMPONENTS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work are limited to the following:

1. General Cable Corp.

B. Description: 100-ohm, four-pair UTP covered with a blue thermoplastic jacket.

1. Comply with ICEA S-90-661 for mechanical properties.
2. Comply with TIA/EIA-568-C.1 for performance specifications.
4. Listed and labeled by an NRTL acceptable to authorities having jurisdiction as complying with UL 444 and NFPA 70 for the following types:
   a. Communications, General Purpose: Type CM or CMG.
   b. Communications, Plenum Rated: Type CMP, complying with NFPA 262.
   c. Communications, Riser Rated: Type CMR, complying with UL 1666.
   d. Communications, Limited Purpose: Type CMX.
   e. Multipurpose: Type MP or MPG.
   f. Multipurpose, Plenum Rated: Type MPP, complying with NFPA 262.

C. Multipurpose, Riser Rated: Type MPR, complying with UL 1666.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine pathway elements intended for cables. Check raceways and other elements for compliance with space allocations, installation tolerance, hazards to camera installation, and other conditions affecting installation.

B. Examine roughing-in for LAN, WAN, and IP network before device installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 WIRING

A. Comply with requirements in Section 260533 "Raceways and Boxes for Electrical Systems."

B. Wiring Method: Install cables in raceways unless otherwise indicated.

1. Except raceways are not required in accessible indoor ceiling spaces and attics.
2. Except raceways are not required in hollow gypsum board partitions.

3. Conceal raceways and wiring except in unfinished spaces.

C. Wiring within Enclosures: Bundle, lace, and train conductors to terminal points with no excess and without exceeding manufacturer's limitations on bending radii. Provide and use lacing bars and distribution spools.

D. Splices, Taps, and Terminations: For power and control wiring, use numbered terminal strips in junction, pull, and outlet boxes; terminal cabinets; and equipment enclosures. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A-486B.

E. For LAN connection and fiber-optic and copper communication wiring, comply with Section 271300 "Communications Backbone Cabling" and Section 271500 "Communications Horizontal Cabling."

F. Grounding: Provide independent-signal circuit grounding recommended in writing by manufacturer.

3.3 VIDEO SURVEILLANCE SYSTEM INSTALLATION

A. Install cameras and infrared illuminators level and plumb.

B. Install cameras with 84-inch minimum clear space below cameras and their mountings. Change type of mounting to achieve required clearance.

C. Set pan unit and pan-and-tilt unit stops to suit final camera position and to obtain the field of view required for camera. Connect all controls and alarms, and adjust.

D. Install power supplies and other auxiliary components at control stations unless otherwise indicated.

E. Install tamper switches on components indicated to receive tamper switches, arranged to detect unauthorized entry into system-component enclosures and mounted in self-protected, inconspicuous positions.

F. Avoid ground loops by making ground connections only at the control station.

1. For 12- and 24-V dc cameras, connect the coaxial cable shields only at the monitor end.

G. Identify system components, wiring, cabling, and terminals according to Section 260553 "Identification for Electrical Systems."

3.4 FIELD QUALITY CONTROL

A. Testing Agency: Owner shall engage a qualified testing agency to perform tests and inspections.

B. Manufacturer's Field Service: Owner shall engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.

C. Perform tests and inspections.
1. Manufacturer's Field Service: Owner shall engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

D. Tests and Inspections:

1. Inspection: Verify that units and controls are properly installed, connected, and labeled, and that interconnecting wires and terminals are identified.

2. Pretesting: Align and adjust system and pretest components, wiring, and functions to verify that they comply with specified requirements. Conduct tests at varying lighting levels, including day and night scenes as applicable. Prepare video-surveillance equipment for acceptance and operational testing as follows:
   a. Prepare equipment list described in "Informational Submittals" Article.
   b. Verify operation of auto-iris lenses.
   c. Set back-focus of fixed focal length lenses. At focus set to infinity, simulate nighttime lighting conditions by using a dark glass filter of a density that produces a clear image. Adjust until image is in focus with and without the filter.
   d. Set back-focus of zoom lenses. At focus set to infinity, simulate nighttime lighting conditions by using a dark glass filter of a density that produces a clear image. Additionally, set zoom to full wide angle and aim camera at an object 50 to 75 feet away. Adjust until image is in focus from full wide angle to full telephoto, with the filter in place.
   e. Set and name all preset positions; consult Owner's personnel.
   f. Set sensitivity of motion detection.
   g. Connect and verify responses to alarms.
   h. Verify operation of control-station equipment.

3. Test Schedule: Schedule tests after pretesting has been successfully completed and system has been in normal functional operation for at least 14 days. Provide a minimum of 20 days' notice of test schedule.

4. Operational Tests: Perform operational system tests to verify that system complies with Specifications. Include all modes of system operation. Test equipment for proper operation in all functional modes.

E. Video surveillance system will be considered defective if it does not pass tests and inspections.

F. Prepare test and inspection reports.

3.5 ADJUSTING

A. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to three visits to Project during other-than-normal occupancy hours for this purpose. Tasks shall include, but are not limited to, the following:

1. Check cable connections.
2. Check proper operation of cameras and lenses. Verify operation of auto-iris lenses and adjust back-focus as needed.
3. Adjust all preset positions; consult Owner's personnel.
4. Recommend changes to cameras, lenses, and associated equipment to improve Owner's use of video surveillance system.
5. Provide a written report of adjustments and recommendations.
3.6 CLEANING

A. Clean installed items using methods and materials recommended in writing by manufacturer.

B. Clean video-surveillance-system components, including camera-housing windows, lenses, and monitor screens.

3.7 TRAINING/DEMONSTRATION (additional requirements)

A. Not required.

END OF SECTION
**ACM Series**

**Power Supply/Chargers with Multi-Output Access Power Controllers**

**Description**
Altronix ACM series distribute and switch power to access control systems and accessories. They convert a 115VAC, 60Hz input into eight (8) independently controlled 12VDC or 24VDC fuse protected outputs. These power outputs can be converted to dry form “C” contacts. Outputs are activated by an open collector sink or normally open (NO) dry trigger input from an Access Control System, Card Reader, Keypad, Push Button, PIR, etc. Units will route power to a variety of access control hardware devices including: Mag Locks, Electric Strikes, Magnetic Door Holders, etc. Outputs will operate in both Fail-Safe and/or Fail-Secure modes. The FACP Interface enables Emergency Egress, Alarm Monitoring, or may be used to trigger other auxiliary devices. The fire alarm disconnect feature is individually selectable for any or all of the eight (8) outputs.

**Key Features**
- Eight (8) independently controlled outputs.
  
  Output options:
  a) Eight (8) Fail-Safe and/or Fail-Secure power outputs;
  b) Eight (8) form “C” 5A rated relay outputs;
  c) Any combination of the above.
- Eight (8) auxiliary power outputs (unswitched).
- Output fuses are rated @ 3.5A.
- Filtered and electronically regulated outputs.
- Supervision:
  - AC Fail
  - Battery Fail and Battery Presence.
- Fire Alarm disconnect (latching or non-latching) is individually selectable for any or all of the eight (8) outputs.
- Alarm output relay indicates that FACP input is triggered
- Fire Alarm disconnect input options:
  a) Normally open (NO) or normally closed (NC) dry contact input
  b) Polarity reversal input from FACP signaling circuit.
- Built-in charger for sealed lead acid or gel type batteries.
- Instantaneous transfer to stand-by batteries.
- UL Listed in the U.S. and Canada.
- Lifetime Warranty / Made in the U.S.A.

**ACM Series Power Supply Configuration Reference Chart**

<table>
<thead>
<tr>
<th>Altronix Model Number</th>
<th>12VDC Total Output Current</th>
<th>24VDC Total Output Current</th>
<th>Fused Outputs</th>
<th>Individual Output Rating</th>
<th>115VAC 60Hz Input Current Draw</th>
<th>Power Supply Board Input Fuse Rating</th>
<th>Power Supply Board Battery Fuse Rating</th>
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</thead>
<tbody>
<tr>
<td>AL400ULACM</td>
<td>4A</td>
<td>3A</td>
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<td>3.5A</td>
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<td>AL400ULACMJ</td>
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</tr>
<tr>
<td>AL600ULACM</td>
<td>6A</td>
<td>6A</td>
<td>8</td>
<td>2.5A</td>
<td></td>
<td>3.5A</td>
<td>5A/250V</td>
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<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>AL1012ULACM</td>
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<td></td>
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<td>2.6A</td>
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<td>15A/32V</td>
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<td>AL1024ULACM</td>
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<td>10A</td>
<td></td>
<td>4.2A</td>
<td></td>
<td>6.3A/250V</td>
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Rev. ULACM-01312018
Specifications

Input
Voltage 115VAC, 60Hz.
Fusing Varies, see Reference Chart.

Outputs
Voltage 12VDC or 24VDC, see Reference Chart.
Current Varies, depending on the model.
Protection Fused 3.5A.
Auxiliary 3.5A (unswitched).
Other Overvoltage protection. Filtered and regulated outputs.

Back-up Battery (not included)
Capacity 12AH / 12VDC (1 or 2 within enclosure).
18AH / 12VDC (requires larger “J” enclosure).
40 AH / 65 AH (requires separate enclosure).
Type Sealed lead acid or gel type.
Fuse Rating 15A @ 32VDC
Failover Upon AC loss, instantaneous.

Fire Alarm Disconnect
Latching or non-latching, individually selectable for any or all of the eight (8) outputs.

Supervision
AC Failure Form “C” contacts.
Battery Form “C” contacts.

Indicators (LED)
Input 115VAC is present.
DC Output Powered.
Battery Discharged or not connected.
Relays Individual LEDs indicate outputs are triggered (relays energized).
FACP Indicates FACP disconnect is triggered.

Agency Listings
All Models:
UL:
UL294 Access Control System Units.
cUL:
CSA C22.2 No.205 Signal Equipment.
AL400ULACM(J), AL600ULACM(J) only:
CSFM California State Fire Marshall Approved.

Physical and Environmental
Dimensions (H x W x D)
AL400ULACM, AL600ULACM, AL1012ULACM, and AL1024ULACM:
15.5” x 12” x 4.5” (393.7mm x 304.8mm x 114.3mm).
AL400ULACMJ, AL600ULACMJ, AL1012ULACMJ, and AL1024ULACMJ:
18” x 14.5” x 4.625” (457.2mm x 368.3mm x 117.48mm).

Product Weight / Shipping (approx.)

<table>
<thead>
<tr>
<th>Model</th>
<th>Product Weight</th>
<th>Shipping Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>AL400ULACM</td>
<td>10.7 lbs. (4.85 kg)</td>
<td>12 lbs. (5.44 kg)</td>
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<tr>
<td>AL400ULACMJ</td>
<td>14 lbs. (6.35 kg)</td>
<td>15 lbs. (6.8 kg)</td>
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<tr>
<td>AL600ULACM</td>
<td>10.3 lbs. (4.67 kg)</td>
<td>11.6 lbs. (5.26 kg)</td>
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<td>14.85 lbs. (6.74 kg)</td>
<td>17.1 lbs. (7.76 kg)</td>
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<td>10.7 lbs. (4.85 kg)</td>
<td>12 lbs. (5.44 kg)</td>
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<td>AL1024ULACMJ</td>
<td>14.9 lbs. (6.76 kg)</td>
<td>16.1 lbs. (7.3 kg)</td>
</tr>
</tbody>
</table>

Temperature
Operating 0ºC to 49ºC (32ºF to 120ºF).
Storage -20ºC to 70ºC (-4ºF to 158ºF).
Relative Humidity 85% +/-5%.

BTU/Hr. (12VDC/24VDC, approx.):

<table>
<thead>
<tr>
<th>Model</th>
<th>12VDC</th>
<th>24VDC</th>
</tr>
</thead>
<tbody>
<tr>
<td>AL400ULACM(J)</td>
<td>25</td>
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<tr>
<td>AL600ULACM(J)</td>
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<tr>
<td>AL1012ULACM(J)</td>
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<td>N/A</td>
</tr>
<tr>
<td>AL1024ULACM(J)</td>
<td>N/A</td>
<td>123</td>
</tr>
</tbody>
</table>

Altronix Corporation | 140 58th St | Brooklyn, NY 11220 USA
phone: +1 718.567.8181 | fax: +1 718.567.9056 | email: info@altronix.com | www.altronix.com
The HUSK-20 is a mechanical hold-up switch designed for silent operation. It is activated by using one finger to press down on the switch. When activated, the switch mechanism locks, insuring an immediate alarm signal. A status window designed on top of the hold-up switch indicates its condition: RED (alarmed) and BLUE (armed). To reset the HUSK-20, use the key provided. The housing is made of metal and is painted gray.

The hold-up switch sends a signal to a dedicated 24 hour hold-up circuit of a burglar control panel. That signal in turn will send the immediate signal to police or central station.

### Specifications

<table>
<thead>
<tr>
<th>Model Number</th>
<th>Stock Number</th>
<th>Contact Type</th>
<th>Contact Rating</th>
<th>Screw Terminals Capacity</th>
<th>Operating Temperature Range</th>
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</thead>
<tbody>
<tr>
<td>HUSK-20</td>
<td>4370038</td>
<td>N.O./N.C.</td>
<td>0.4A 5A 5A</td>
<td>AWG #18</td>
<td>-4°F - 176°F (-20°C - 80°C)</td>
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<td>KEY</td>
<td>4370039</td>
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### Typical Wiring

```
N.C.       COM.   E.O.L.R
N.O.       HOLD-UP Circuit

N.C.       COM.   E.O.L.R
N.O.       HOLD-UP Circuit

COM. : Common
N.C. : Normally Close
N.O. : Normally Open
E.O.L.R : End Of Line Resistor
```
**AXIS A8105-E**

Small and powerful door security

AXIS A8105-E is a small and powerful network video door station. It operates as a communication device and full-fledged security camera at the same time, providing HDTV video, audiovisual identification, two-way communication and remote entry control as a natural part of video surveillance. Open standards such as ONVIF and Session Initiation Protocol (SIP) in combination with its small size, give unique opportunities for system design, integration and installation. Wide Dynamic Range (WDR) and efficient noise cancellation ensure uncompromised performance in demanding situations, such as strong backlight or surrounding noise. Axis’ Digital Corridor Format easily adjusts the viewing area to the location.

> High-quality audio and video
> Axis’ Digital Corridor Format
> Remote entry control
> SIP support
> Zipstream
**Axis A8105-E**

**Camera**
- **Image sensor**: 1/2.8” progressive scan RGB CMOS
- **Lens**: 1.56 mm, F2.8
- **Horizontal field of view**: 180°
- **Vertical field of view**: 120°
- **Fixed focus**, IR corrected

**Minimum illumination**
- **LED lit**: 0 lux
- **LED unit (with WDR)**: 2.23 lux
- **LED unit (without WDR)**: 1.96 lux

**Shutter time**
- 1/14300 s to 2 s with 50 Hz
- 1/14300 s to 2 s with 60 Hz

**Video**
- **Video compression**: H.264 (MPEG-4 Part 10/AVC), Baseline, Main, and High profiles
- **Motion JPEG**: Axis' Zipstream technology in H.264, Controllable frame rate and bandwidth
- **Capture modes**: 1920x1200 25/20fps @50/60 Hz (WDR), 1920x1200 50/30 fps @50/60 Hz (no WDR)

**Video streaming**
- Multiple, individually configurable streams in H.264 and Motion JPEG

**Image settings**
- **Compression**: Color, Brightness, Sharpness, Contrast, White balance, Exposure control, Fine-tuning of behavior at low light, WDR - forensic capture, Rotation: Auto, 0°, 90°, 180°, 270° including Axis' Digital Corridor Format, Portrait/Landscape, Text and image overlay, Mirroring of images, Privacy mask.

**Pan/Tilt/Zoom**
- **Digital PTZ**

**Audio**
- **Audio streaming**: Two-way, full duplex
- **Echo cancellation and noise reduction**

**Audio compression**
- AAC-LC 8/16 KHz, G.711 PCM 8 KHz, G.726 ADPCM 8 KHz, G.722 (in SIP calls only)
- Configurable bit rate

**Audio input/output**
- Built-in microphone (can be disabled), Built-in speaker
- 85 dB (at 0.5 m / 20 in)

**Lock control**
- **Lock integration**: Integration with AXIS A8001 Safety Relay Box: 300 mA at 12 V DC
- Integration with AXIS A1001 Network Door Controller: maximum voltage/current: 0.7 A at 30 V

**Network**
- **Security**: Password protection, IP address filtering, HTTPS encryption, IEEE 802.1X network access control, Digest authentication, User access log, Centralized Certificate Management

**Supported protocols**
- IPv4/6, HTTP, HTTPS, SSL/TLS, QoS Layer 3 DiffServ, FTP, CIF/SMI, SMTP, Bonjour, UPl/PIM, SNMP v1/v2c/v3 (MIB-II), DNS, DynDNS, NTP, RTSP, RTP, TCP, UDP, IGMP, RTCP, ICMP, DHCP, ARP, SDP, SIP, SIP, RTSP, SIP TLS

**System integration**
- **Application Programming Interface**: Open API for software integration, including VAPIX® and Axis Camera Application Platform; specifications at www.axis.com
- **Axis Video Hosting System (AVHS)** with One-Click Connection ONVIF Profile S, specification at www.onvif.org
- **Software**: Third-party video management software and mobile applications. See www.axis.com for compatibility
- **VoIP**: Support for Session Initiation Protocol (SIP) for integration with Voice over IP (VoIP) systems, peer to peer or peer to IP with SIP/PBX.
  - Tested with various SIP software such as Cisco, Bria and Grandstream
  - Tested with various PBX softwares such as Cisco, Avaya and Asterisk

**Analytics**
- **Included**: AXIS Video Motion Detection 3, Active tampering alarm, Audio detection

**Support for AXIS Camera Application Platform enabling installation of additional applications**, see www.axis.com/acap

**Event triggers**
- **Analytics**, External input, Edge storage events
- **Call**: DTMF, State, State changes
- **Detectors**: Audio detection, Live stream access, Shock detection
- **Hardware**: Temperature, Tilt detection, Network Input Signal: Digital Input Port, Manual trigger, Virtual inputs
- **Storage**: Disruption, Recording
- **System**: System ready
- **Time**: Recurrence, Use schedule

**Event actions**
- **Axis door control**, video and audio recording to edge storage, Pre- and post-alarm video buffering, External output activation

**Data streaming**
- Event data

**Built-in installation aids**
- Pixel counter

**General**
- **Casing**: IP65- and NEMA 4X-rated, aluminum casing, stainless steel button, polycarbonate (PC) dome
- **Color**: White NCS S 1002-B

**Sustainability**
- **PVC free**

**Memory**
- 256 MB RAM, 128 MB Flash

**Power**
- **Power output**: 1x12 V DC, Max. out: 350 mA at 12 V DC
- **Relay**: See Lock control
- **Power over Ethernet**: IEEE 802.3af/802.3at Type I Class 3, b

**Connectors**
- RJ45 10BASE-T/100BASE-TX PoE
- 10BASE-T: 6-pin 3.81 mm terminal block. 2 I/O, 12 output (max 350mA) and 1 relay

**Storage**
- **Support for microSD/microSDHC/microSDXC card**
- **Support for recording to dedicated network-attached storage (NAS)**. For SD card and NAS recommendations see www.axis.com

**Operating conditions**
- -25° to 55°C (-13° to 131°F)
- Humidity: 10-100% RH (condensing)

**Approvals**

**Dimensions**
- H x D x W: 147.5 mm x 35 mm x 48 mm
- Flush mount: 217 mm x 40 mm x 105 mm

**Weight**
- 280 g (9.88 oz)

**Included accessories**
- Installation Guide, Retailor T20 bit, Terminal block connector, Cable gasket, AXIS Connector guard A, Axis' Authentication key

**Mounting option**
- Wall Mount or recessed with AXIS A8105-E Flush Mount accessory

**Optional accessories**
- **AXIS A8105-E Flush Mount, AXIS A9801 Security Relay Box, AXIS T8120 PoE Injector**
- For more accessories, see www.axis.com

**Video management software**
- Video management software from Axis and Application Development Partners (not included). For more information, see www.axis.com/products/video/software

**Languages**
- English, German, French, Spanish, Italian, Russian, Simplified Chinese, Japanese, Korean, Portuguese, Traditional Chinese

**Warranty**
- Axis 3-year warranty and AXIS Extended Warranty option, see www.axis.com/warranty

- This product includes software developed by the OpenSSL Project for use in the OpenSSL Toolkit, (www.openssl.org), and cryptographic software written by Eric Young (eay@cryptsoft.com).
- Support for one lock (max. total 300 mA). For higher power requirements connect external power (max. 30V DC 0.7A).

**Environmental responsibility**
- www.axis.com/environmental-responsibility

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The DS150i Series consists of the DS150i Detector (light gray) and the DS151i Detector (black). They are specifically designed for Request-to-exit (REX) applications. The DS150i and DS151i detect motion in their coverage area and signal an access control system or door control device.

### Functions

- Single or double door use
- Wall or ceiling mountable
- Internal vertical pointability
- Wrap-around coverage pattern
- Selectable relay trigger mode

### Certification and approvals

<table>
<thead>
<tr>
<th>Region</th>
<th>Certification</th>
<th>Certification Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Australia</td>
<td>RCM</td>
<td>[DS150i]</td>
</tr>
<tr>
<td>Europe</td>
<td>CE</td>
<td>EMC, LVD, RoHS</td>
</tr>
<tr>
<td>USA</td>
<td>UL</td>
<td>ALVY: Access Control Systems Units (UL294)</td>
</tr>
</tbody>
</table>
Front View and Top Views
A front view of the DS150i and DS151i coverage, as well as top views of the coverage pattern on the floor. The typical coverage measurements are 2.4 m x 3 m (8 ft x 10 ft).

Side View
A side view of the DS150i and DS151i coverage pattern.

Technical specifications

**Electrical**

<table>
<thead>
<tr>
<th>Specification</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Current Draw</td>
<td>26 mA at 12 VDC</td>
</tr>
<tr>
<td>Voltage</td>
<td>12 VAC or VDC, 24 VAC or VDC</td>
</tr>
</tbody>
</table>

**Mechanical**

<table>
<thead>
<tr>
<th>Specification</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alarm Output</td>
<td>Two Form C relay contacts</td>
</tr>
<tr>
<td>Indicators</td>
<td>One activation LED</td>
</tr>
<tr>
<td>Relay Latch Time</td>
<td>Adjustable to 60 sec</td>
</tr>
<tr>
<td>Enclosure Dimensions</td>
<td>3.8 cm x 15.9 cm x 3.8 cm (1.5 in. x 6.25 in. x 1.5 in.)</td>
</tr>
<tr>
<td>Enclosure Material</td>
<td>High impact ABS plastic enclosure</td>
</tr>
<tr>
<td>Power Loss Default Mode</td>
<td>Programmable fail-safe or fail-secure modes.</td>
</tr>
<tr>
<td>Timer Mode</td>
<td>Programmable reset (accumulative) or non-reset (counting) mode.</td>
</tr>
<tr>
<td>Mounting Location</td>
<td>Surface mount on wall or ceiling</td>
</tr>
</tbody>
</table>

**Environmental**

<table>
<thead>
<tr>
<th>Specification</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating Temperature</td>
<td>-29°C to +49°C (-20°F to +120°F)</td>
</tr>
<tr>
<td>Radio Frequency Interference (RFI) Immunity</td>
<td>No alarm or setup on critical frequencies in the range from 26 MHz to 1000 MHz at 50 V/m.</td>
</tr>
</tbody>
</table>

**Ordering information**

**DS150i Request-to-exit PIR Detector**
For use in Request-to-ExIt (REX) applications. Provides PIR, 2.4 m x 3 m (8 ft x 10 ft) coverage.
Order number DS150i

**DS151i Request-to-exit PIR Detector**
Black enclosure. For use in Request-to-EXit (REX) applications. Provides PIR, 2.4 m x 3 m (8 ft x 10 ft) coverage.
Order number DS151i

**Accessories**

**TP160 Trim Plate**
A light gray trim plate used when mounting the detector over a standard single-gang box.
Order number TP160

**TP161 Trim Plate**
A black trim plate used when mounting the sensor over a standard single-gang box.
Order number TP161
A light gray trim plate used when mounting the detector over a standard single-gang box.

**Ordering information**

**TP160 Trim Plate**
A light gray trim plate used when mounting the detector over a standard single-gang box.
Order number **TP160**
180 Series 3/4" and 1" Steel Door Recessed Switch Sets

- Lifetime Warranty
- Colors: White, Brown, Grey or Black
- UL and ULC Approved
- 180-12 & 184-12 UL 10C Fire Rated
- Available in Closed Loop, Open Loop and SPDT
- 3/4" and 1" Diameter Mounting
- Standard 12" Leads or Terminals
- Self-Locking
- Solid, One Piece Design
- 7/8" Diameter also Available - Call Factory
- Switches or Magnets are Available Separately
- Standard 1/2"+ Gap on Steel
- Wide Gap 1"+ Gap on Steel
- Supervisory Loops Available

The GRI 180 Series is the industry standard 3/4" diameter recessed steel door switch set with 12" leads. The 184 Series is a 1" diameter switch set.

The innovative GRI 8080-T Series is a 3/4" diameter recessed switch set designed for residential, commercial and industrial steel doors and frames. The shorter length and the introduction of PC board type terminals makes the installation of the set quick and simple with no soldering, B connectors or tape to catch during installation or removal, reducing the cost of installation and creating greater profitability.
RECESSED 3/4” & 1” STEEL DOOR SWITCH SET

180/184/8080-T SERIES

- Recessed Magnetic Contact
- 12” #22AWG Leads or Screw Terminals
- Longer Leads, Zip Cord or Jacketed Cable Upon Request
- Built-in E.O.L. Resistors and Diodes Upon Request
- Supervisory Loops Upon Request
- Switches and Magnets Available Separately
- Colors: White, Brown, Gray, Black
- Indicates U.L. 10C Fire Rated

PART NUMBERS:

<table>
<thead>
<tr>
<th>Standard Gap Up To 1/2”</th>
<th>Closed Loop</th>
<th>Open Loop</th>
<th>SPDT</th>
<th>DPDT</th>
</tr>
</thead>
<tbody>
<tr>
<td>3/4” Dia.</td>
<td>180-12</td>
<td>185-12</td>
<td>190-12</td>
<td>195-12</td>
</tr>
<tr>
<td>1” Dia.</td>
<td>184-12</td>
<td>189-12</td>
<td>194-12</td>
<td>199-12</td>
</tr>
<tr>
<td>3/4” Dia.</td>
<td>8080-T</td>
<td>8585-T</td>
<td>8585-T</td>
<td>8989-T</td>
</tr>
<tr>
<td>1” Dia.</td>
<td>8484-T</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Wide Gap 3/4”+</th>
<th>Closed Loop</th>
<th>Open Loop</th>
<th>SPDT</th>
<th>DPDT</th>
</tr>
</thead>
<tbody>
<tr>
<td>3/4” Dia.</td>
<td>180-12WG</td>
<td>185-12WG</td>
<td>190-12WG</td>
<td>195-12WG</td>
</tr>
<tr>
<td>1” Dia.</td>
<td>184-12WG</td>
<td>189-12WG</td>
<td>194-12WG</td>
<td>199-12WG</td>
</tr>
<tr>
<td>3/4” Dia.</td>
<td>8080-TWG</td>
<td>8585-TWG</td>
<td>8585-TWG</td>
<td></td>
</tr>
<tr>
<td>1” Dia.</td>
<td>8484-TWG</td>
<td></td>
<td>8989-TWG</td>
<td></td>
</tr>
</tbody>
</table>

*Gaps will increase substantially for installations other than steel
*Gaps up to one inch on steel when paired with MC-180 Door Channel Magnet

7/8” Diameter Also Available. P/N 81-12 and 81-12WG. White or Black only. Please call factory.

WARRANTY:
Lifetime warranty against workmanship, material and factory defects.

GEORGE RISK INDUSTRIES, INC.
G.R.I. PLAZA
KIMBALL, NE 69145

TOLL-FREE 1-800-445-5218
TOLL-FREE 1-800-523-1227
(308) 235-4645
FAX (308) 235-3561
E-MAIL: sales@grisk.com
WEB SITE: www.grisk.com
INSTALLATION APPLICATIONS: The G.R.I. 180-12 is the industry standard 3/4” diameter recessed steel door switch set with 12” leads. The innovative G.R.I. 8080-T series is a 3/4” diameter recessed switch set designed for residential, commercial and industrial steel doors and frames. The shorter length terminals makes the installation of the set quick and simple.

PART LOOP ELECTRICAL REED MAXIMUM MAXIMUM MAXIMUM MAXIMUM
NUMBER TYPE CONFIG. FORM INITIAL CONTACT RESISTANCE (Ω) INITIAL CONTACT RATING (W) MAXIMUM SWITCHING VOLTAGE (VDC) MAXIMUM SWITCHING CURRENT (A)
180-12 Closed N/O A .150 10 200 .400
180-12WG Closed N/O A .150 10 200 .400
184-12 Closed N/O A .150 10 200 .400
184-12WG Closed N/O A .150 10 200 .400
8080-T Closed N/O A .150 10 160 .400
8080-TWG Closed N/O A .150 10 160 .400
8484-T Closed N/O A .150 10 160 .400
8484-TWG Closed N/O A .150 10 160 .400
185-12 Open N/C B .140 5 175VDC .250
185-12WG Open N/C B .140 5 175VDC .250
189-12 Open N/C B .140 5 175VDC .250
189-12WG Open N/C B .140 5 175VDC .250
8585-T Open N/C B .140 5 175VDC .250
8585-TWG Open N/C B .140 5 175VDC .250
8989-T Open N/C B .140 5 175VDC .250
8989-TWG Open N/C B .140 5 175VDC .250
190-12 Open/Closed SPDT C .140 5 175VDC .250
190-12WG Open/Closed SPDT C .140 5 175VDC .250
194-12 Open/Closed SPDT C .140 5 175VDC .250
194-12WG Open/Closed SPDT C .140 5 175VDC .250
195-12 DPDT C X 2 .140 5 175VDC .250
195-12WG DPDT C X 2 .140 5 175VDC .250
199-12 DPDT C X 2 .140 5 175VDC .250
199-12WG DPDT C X 2 .140 5 175VDC .250

CONTACT YOUR G.R.I. DISTRIBUTOR OR CALL:

GEORGE RISK INDUSTRIES, INC.
G.R.I. PLAZA
KIMBALL, NE 69145
MC-180

- The MC-180 is designed to be mounted in the top channel of a metal entry/exit door.
- Legs of the magnet case can be clipped to accommodate a more shallow channel.

WARRANTY:
Lifetime warranty against workmanship, material and factory defects.
HES® 1600 Electric Strike

Works with all brands of cylindrical and mortise locksets, with or without a deadbolt

The HES 1600 Series electric strike accommodates up to a 1" deadbolt with enhanced vertical cavity spacing.

The HES 1600 Series Electric Strikes set a new standard in the industry by offering dynamic integrated adjustability and field configurable options compatible with any cylindrical or mortise lock. The modular design of the platform makes stocking and installing easier with interchangeable faceplates and accessories. For the first time, the aesthetics of an electric strike are complementary to other surrounding door hardware and blend in with the opening due to the fully finished design, available in seven finishes.

Features

**Standard Features**
- Stainless steel construction
- Tamper-resistant
- Static strength 1,500 lbs
- Dynamic strength 70 ft-lbs
- Endurance 1 million cycles
- Field selectable fail safe/fail secure
- Non-handed
- Interchangeable faceplates and accessories
- Field replaceable components
- Fully finished faceplate, keeper, case and trim
- Field adjustable integrated shim
- ElectroLynx® connectors
- Strike body depth 1 5/8"
- Static strength: 1500 lbs
- SecuriCare five-year, no fault, no questions asked warranty

**Optional Features**
- LM Lock monitor
- DLM Dual lock monitors
- LMS Lock monitor and strike monitor
- DLMS Dual lock monitors and strike monitor

**Accessories**
- 157 Torx screws
- HESCUT-MTK Metal template kit
- 1600-104-xxx Lip extension trim adapter (finish to match)
- 1600-106-xxx 1006 adapter and trim enhancer kit (finish to match)
- OPT-1SRK Spring replacement kit
- OPT-1LM Single lock monitor
- OPT-1DLM Dual lock monitors
- MOD-1SOL Solenoid replacement module

The 1600 Series is also available in a Complete One Box Solution
Specifications

Certifications
- ANSI/BHMA A156.31, Grade 1
- UL 1034 burglary-resistant listed and suitable for outdoor use
- UL 294 (6th Edition) listed
- RoHS compliant
- Static strength: 1500 lbs
- UL 10C fire-rated, 3 hour single door (fail secure only)
- UL 10C fire-rated, 1-1/2 hour double door (fail secure only)
- CAN/ULC-S104 fire door conformant
- NFPA-252 fire door compliant
- ASTM-E152 fire door compliant
- California Fire Marshal listed
- ANSI/SDI A250.13 windstorm resistant
- Florida Building Code approved TAS 201, 202, 203
- ANSI-ASTM E330

Frame Application
- Metal
- Wood

Electrical (DC Continuous Duty)
- Dual voltage 12/24 VDC/VAC
- 240 mA at 12 VDC/120 mA at 24 VDC
- PoE friendly

How to Order

<table>
<thead>
<tr>
<th>Series</th>
<th>Model</th>
<th>Finish*</th>
<th>Option (s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1600</td>
<td>CS</td>
<td>605 Bright Brass</td>
<td>– LM Lock Monitor</td>
</tr>
<tr>
<td></td>
<td></td>
<td>606 Satin Brass</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>612 Satin Bronze</td>
<td>DLM Dual Lock Monitor</td>
</tr>
<tr>
<td>CLB</td>
<td></td>
<td>613 Bronze Toned</td>
<td>LMS Lock Monitor and Strike Monitor*</td>
</tr>
<tr>
<td></td>
<td></td>
<td>613E Dark Oxidized Satin Bronze</td>
<td></td>
</tr>
<tr>
<td>CDB</td>
<td></td>
<td>629 Bright Stainless Steel</td>
<td>OPT-1LM Single Lock Monitor</td>
</tr>
<tr>
<td></td>
<td>630 Satin Stainless Steel</td>
<td>OPT-1DLM Dual Lock Monitors</td>
<td></td>
</tr>
<tr>
<td></td>
<td>BSP Black Suede Powder</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Complete Packs are only available in the 630 finish
HES 1500C Complete Electric Strike

*For all cylindrical and mortise locksets with 3/4" latchbolt*

The 1500C includes a 1500 electric strike body and the 1LB faceplate kit for latchbolts:

- 1J Option
- 1K Option
- 1KM Option
- 1KD Option

**Compatible Locksets**

HES 1600CLB Complete for Latchbolt Locks

*The Complete One Box Solution for all cylindrical and mortise locksets*

The 1600CLB includes a 1600 electric strike body and the 1LB faceplate kit for latchbolts:

- 1J Option
- 1K Option
- 1KM Option
- 1KD Option

**Compatible Locksets**

HES 1600CS Complete Electric Strike

*The Complete One Box Solution for all cylindrical and mortise locksets, with or without a 1" deadbolt*

The 1600CS includes a 1600 electric strike body, the 1LB faceplate kit for latchbolts and the 1DB faceplate kit for deadbolts:

- 1J Option
- 1K Option
- 1KM Option
- 1KD Option

**Compatible Locksets**

HES 1006CDB Complete for Deadbolt Locks

*The Complete One Box Solution for all locksets with a 1" deadbolt.*

The 1600CDB includes a 1600 electric strike body and the 1DB faceplate kit for deadbolts:

- 1N Option
- 1NM Option
- 1ND Option
- 1NTD Option

**Compatible Locksets**

---

ASSA ABLOY

The global leader in door opening solutions
# HES 1500 & 1600 Series Faceplate Options

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
<th>Dimensions</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1LB Option</strong></td>
<td>After releasing the latchbolt, the keeper returns to the locked position.</td>
<td>4-7/8&quot; x 1-1/4&quot;</td>
</tr>
<tr>
<td><strong>The Latchbolt Solution:</strong></td>
<td>Includes the hardware to accommodate every cylindrical and mortise lock up to a 3/4&quot; latchbolt. For metal frame applications.</td>
<td></td>
</tr>
<tr>
<td><strong>1LB-2 Option</strong></td>
<td>After releasing the latchbolt, the keeper returns to the locked position.</td>
<td>9&quot; x 1-3/8&quot;</td>
</tr>
<tr>
<td><strong>The Deadbolt Solution:</strong></td>
<td>Includes the hardware to accommodate every cylindrical and mortise lock up to a 3/4&quot; latchbolt. For wood frame applications.</td>
<td></td>
</tr>
<tr>
<td><strong>The Deadbolt Solution:</strong></td>
<td>Includes all hardware to retain, and release all mortise locks, and tubular deadbolts up to a 1&quot; latchbolt. For metal frame applications.</td>
<td>4-7/8&quot; x 1-1/4&quot;</td>
</tr>
<tr>
<td><strong>The Deadbolt Solution:</strong></td>
<td>Includes all hardware to retain, and release all mortise locks, and tubular deadbolts up to a 1&quot; latchbolt. For wood frame applications.</td>
<td>9&quot; x 1-3/8&quot;</td>
</tr>
</tbody>
</table>

**Operation:** This deadbolt solution offers two modes of functionality: night latch, lockout, and normally extended deadbolt. (Functional operation modes described below.)

---

**The Deadbolt Solution:** Includes all hardware to retain, and release all mortise locks, and tubular deadbolts up to a 1" latchbolt. For wood frame applications.
### HES 1500 & 1600 Series Faceplate Dimensions

<table>
<thead>
<tr>
<th>Faceplate Option</th>
<th>1J</th>
<th>1K</th>
<th>1KD</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Faceplate Option</strong></td>
<td>1-23/32&quot; [43.64]</td>
<td>29/32&quot; [23.39]</td>
<td>1-11/32&quot; [34.11]</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Faceplate Option</th>
<th>1KM</th>
<th>1N</th>
<th>1ND</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Faceplate Option</strong></td>
<td>1-3/32&quot; [27.81]</td>
<td>3-1/8&quot; [79.37]</td>
<td>3-1/8&quot; [79.37]</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Faceplate Option</th>
<th>1NM</th>
<th>1NTD</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Faceplate Option</strong></td>
<td>1/8&quot; [3.17]</td>
<td>1-1/4&quot; [32.00]</td>
</tr>
<tr>
<td>2-7/8&quot; [73.02]</td>
<td>13/16&quot; [20.50]</td>
<td>1-1/2&quot; [38.10]</td>
</tr>
<tr>
<td>1-9/64&quot; [28.83]</td>
<td>15/16&quot; [23.80]</td>
<td>23/32&quot; [18.22]</td>
</tr>
</tbody>
</table>

*For use with" information is offered as a recommendation only. Reference should be made to the lockset manufacturer for proper installation instructions necessary to meet compatibility requirements.*

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**The global leader in door opening solutions**

**ASSA ABLOY**
# HES 1500 & 1600 Series Faceplate Dimensions

## 1J-2 Faceplate Option
![1J-2 Faceplate Option Diagram](image1)

<table>
<thead>
<tr>
<th>Measurement</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Width</td>
<td>1.72&quot; (43.63)</td>
</tr>
<tr>
<td>Height</td>
<td>3.63&quot; (92.22)</td>
</tr>
<tr>
<td>Thickness</td>
<td>0.86&quot; (21.81)</td>
</tr>
</tbody>
</table>

## 1KM-2 Faceplate Option
![1KM-2 Faceplate Option Diagram](image2)

<table>
<thead>
<tr>
<th>Measurement</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Width</td>
<td>1-15/32&quot; (37.29)</td>
</tr>
<tr>
<td>Height</td>
<td>3-1/8&quot; (80)</td>
</tr>
<tr>
<td>Thickness</td>
<td>19/32&quot; (15.46)</td>
</tr>
</tbody>
</table>

## 1N-2 Faceplate Option
![1N-2 Faceplate Option Diagram](image3)

<table>
<thead>
<tr>
<th>Measurement</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Width</td>
<td>3-1/8&quot; (79.37)</td>
</tr>
<tr>
<td>Height</td>
<td>2-25/32&quot; (71)</td>
</tr>
<tr>
<td>Thickness</td>
<td>3-1/8&quot; (79.37)</td>
</tr>
<tr>
<td>ANSI Lock</td>
<td>Description</td>
</tr>
<tr>
<td>-----------</td>
<td>-------------</td>
</tr>
<tr>
<td></td>
<td><strong>Mortise locksets</strong>&lt;br&gt;Mortise lockset without a deadbolt</td>
</tr>
<tr>
<td></td>
<td>Corbin Russwin&lt;br&gt;ML2000 and Arrow</td>
</tr>
<tr>
<td></td>
<td>Sargent 7700 and&lt;br&gt;8100 Schlage L9000</td>
</tr>
<tr>
<td></td>
<td>Sargent 7900, &lt;br&gt;8200, and 9200</td>
</tr>
<tr>
<td></td>
<td>Accurate, Falcon, Kaba Ilco/&lt;br&gt;Unican, Yale 8700&lt;br&gt;(manufactured after 2005),&lt;br&gt;Yale 8800</td>
</tr>
<tr>
<td></td>
<td><strong>Mortise locksets</strong>&lt;br&gt;Mortise lockset with a 1” deadbolt</td>
</tr>
<tr>
<td></td>
<td>Sargent, Yale</td>
</tr>
</tbody>
</table>

*Not intended for continuous recapture of a 1” deadbolt - use 1006 CAS*
## Lock Cross Reference

<table>
<thead>
<tr>
<th>ANSI Lock</th>
<th>Description</th>
<th>Manufacturer</th>
<th>Electric Strikes</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Cylindrical lockset</strong></td>
<td>Latchbolt for aluminum stile doors</td>
<td>All manufacturers</td>
<td>5000C, 5200C, 1500C, 7000C, 1006-J, <strong>1600-1LB</strong>, UNL</td>
</tr>
<tr>
<td><strong>Cylindrical lockset</strong></td>
<td>Cylindrical lockset up to 5/8&quot; throw</td>
<td>All manufacturers</td>
<td>1006CS, <strong>1600-CS</strong>, 1606CLB, 1600-CLB, 1006-J, 1600-1LB, 1500C, 4500C, 5000C, 7000C, 8000C, 8300C, 712, 310-2, UNL, Vista V3 (now Alarm Controls AES300)</td>
</tr>
<tr>
<td><strong>Cylindrical lockset</strong></td>
<td>Cylindrical lockset up to 3/4&quot; throw</td>
<td>All manufacturers</td>
<td>1006CS, <strong>1600-CS</strong>, 1006CLB, 1600-CLB, 1006-J, 1600-1LB, 1500C, 4500C, 5200C, 7501, 310-75, 712-75</td>
</tr>
<tr>
<td><strong>Rim mounted</strong></td>
<td>Pullman rim mounted exit device up to 1/2&quot; throw</td>
<td>All Manufacturers</td>
<td>9400, 7000-789S</td>
</tr>
<tr>
<td><strong>Rim mounted</strong></td>
<td>Pullman rim mounted exit device up to 3/4&quot; throw</td>
<td>All Manufacturers</td>
<td>9500, <strong>9600</strong>, 7000-783S, 7000-786S, 310-4</td>
</tr>
<tr>
<td><strong>Rim mounted</strong></td>
<td>Squarebolt® style rim mounted exit devices</td>
<td>Corbin Russwin (SecureBolt™), Yale (SquareBolt®)</td>
<td>9700, 310-4S</td>
</tr>
</tbody>
</table>

- **HES and Folger Adam electric strikes are designed to be installed in accordance with the ANSI/BHMA A156.31 4-7/8” jam preparation.**
- **When accommodating a cylindrical lock, the electric strike is to be installed centerline to centerline.**
- **When accommodating a mortise lock, the centerline of the electric strike is to be installed 3/8” above the centerline of the mortise lock, except as noted for individual strikes. Folger Adam 712 series and 310 series will need special alignment with used with a mortise lock.**
- **HES electric strikes are all non-handed and designed for installation in hollow metal, concrete filled metal, aluminum and wood jambs.**
- **Folger Adam electric strikes are all non-handed and designed for installation in hollow metal, aluminum and wood jambs.**
HES® 2005M3
SMART Pac® III

In-line power controller able to receive input voltages from 12-32VAC or DC

Longer Strike Life
- FREE warranty upgrade with installation
- Provides cooler, more efficient operation
- Self-resetting fuse protects strike against over-current condition

Versatile
- Can be used with all HES, Adams Rite or Folger Adam electric strikes
- Accepts wide range of input voltage: 12-32 Volts AC or DC
- Supports fail secure or fail safe configured electric strikes

Intelligent
- Diagnostics for voltage detection
- Output 12VDC or 24VDC, depending on input voltage
- Continuous duty; reduces initial voltage by 25% after a fixed period of time

Features

Standard Features
- Built-in bridge rectifier
- Reduces initial voltage by 25% to extend the life of the electric strike
- Includes built-in resettable fuse, MOV, voltage regulation and input voltage level indicating and unit status
- For use with 1006, input voltage must be DC

Optional Features
Addition of SMART Pac® III to any electric strike extends the 5-year no-fault warranty to a 10-year no-fault warranty.
HID Proximity

125 kHz Cards and Readers

ACCESS SECURE IDENTITY

An ASSA ABLOY Group brand
HID Global is focused on creating customer value as the trusted source for products, services and know-how related to the delivery of secure identity.
For security managers, dealers, integrators and OEMs, HID proximity cards and readers are recognized as the industry standard for physical access control. Featuring 125 kHz RFID technology, HID proximity products are robust, affordable and seamlessly integrate with access control systems.

**Did you know?**

*When you buy Genuine HID™ products, you are buying with confidence. Every Prox product is backed by:*

- Guaranteed card to reader compatibility
- Seamless prox to smart card migration solutions
- Broadest product line in the industry
- Global supplier with global agency certifications
- Industry’s first lifetime warranty
HID Proximity Readers

Did you know?

ProxPoint® Plus
125 kHz value priced proximity card reader
Base Part Number • 6005, 6008
- Small sized reader features a beeper and multicolor LED which can be host and/or locally controlled
- Can mount directly on metal with no change in read range performance
- Power requirements: 5-16 VDC
- Dimensions: 3.14” x 1.70” x 0.66” (7.96 cm x 4.3 cm x 1.68 cm)
- Read Range: up to 3.0” (7.5 cm)*

MiniProx®
125 kHz mullion mount proximity card reader
Base Part Number • 5365, 5368
- Power requirements: 5-16 VDC
- Dimensions: 6.0” x 1.7” x 1.0” (15.2 cm x 4.3 cm x 1.91 cm)
- Read Range: up to 5.5” (14.0 cm)*

Thinline® II
125 kHz low profile proximity card reader
Base Part Numbers • 5395, 5398
- The size of most standard U.S. switch plates
- Available with Wiegand or Clock-and-Data interface
- Power requirements: 5-16 VDC
- Dimensions: 4.7” x 3.0” x 0.68” (11.9 cm x 7.6 cm x 1.7 cm)
- Read Range: up to 5.5” (14.0 cm)*

* Dependent upon installation conditions and credential type
Did you know?
HID’s ProxPass® II active vehicle tag enables convenient, hands-free parking control when used with the MaxiProx reader.
<table>
<thead>
<tr>
<th></th>
<th>ProxPoint Plus&lt;sup&gt;®&lt;/sup&gt;</th>
<th>MiniProx&lt;sup&gt;®&lt;/sup&gt;</th>
<th>Thinline&lt;sup&gt;®&lt;/sup&gt; II</th>
<th>ProxPro&lt;sup&gt;®&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Base Model Number</strong></td>
<td>6005B/6008B</td>
<td>5365E/5368E</td>
<td>5395C/5398C</td>
<td>5355A/5352A/5358A</td>
</tr>
<tr>
<td><strong>Dimensions</strong></td>
<td>3.13” x 1.7” x .66”</td>
<td>6.0” x 1.7” x 1.0”</td>
<td>4.7” x 3.0” x .68”</td>
<td>5.0” x 5.0” x 1.0”</td>
</tr>
<tr>
<td></td>
<td>(8.0 cm x 4.5 cm x 1.5 cm)</td>
<td>(15.0 cm x 4.5 cm x 2.0 cm)</td>
<td>(12.0 cm x 7.5 cm x 1.5 cm)</td>
<td>(12.5 cm x 12.5 cm x 2.5 cm)</td>
</tr>
<tr>
<td><strong>Weight</strong></td>
<td>3.6 oz (102 g)</td>
<td>7.89 oz (224 g)</td>
<td>7.33 oz (208 g)</td>
<td>9.62 oz (273 g)</td>
</tr>
<tr>
<td><strong>Read Range</strong></td>
<td>Up to 3.0” (7.5 cm)</td>
<td>Up to 5.5” (14.0 cm)</td>
<td>Up to 8.0” (20.5 cm)</td>
<td></td>
</tr>
<tr>
<td><strong>Mounting</strong></td>
<td>Mullion</td>
<td>Single-gang electrical box</td>
<td>Glass Mount Kit Available</td>
<td></td>
</tr>
<tr>
<td><strong>Power Supply</strong></td>
<td>5-16 VDC</td>
<td>10-28.5 VDC</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Current Requirements</strong></td>
<td>30/75 mA</td>
<td>30/75 mA</td>
<td>30/110 mA @ 5 VDC</td>
<td>100/120 mA</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>20/115 @ 12 VDC</td>
<td></td>
</tr>
<tr>
<td><strong>Termination</strong></td>
<td>Pigtail</td>
<td>Pigtail or Terminal Strip</td>
<td>Pigtail</td>
<td></td>
</tr>
<tr>
<td><strong>Output Formats</strong></td>
<td>Wiegand or Clock-and-Data</td>
<td></td>
<td>Wiegand, Clock-and-Data, RS-232 or RS-422</td>
<td></td>
</tr>
<tr>
<td><strong>Tamper</strong></td>
<td>No</td>
<td>No</td>
<td>Switch</td>
<td></td>
</tr>
<tr>
<td><strong>Indoor/Outdoor</strong></td>
<td>IP55 Certified</td>
<td></td>
<td>IP55 Certified</td>
<td></td>
</tr>
<tr>
<td><strong>Warranty</strong></td>
<td>Lifetime</td>
<td></td>
<td>Lifetime</td>
<td></td>
</tr>
</tbody>
</table>
## Comparison Chart

<table>
<thead>
<tr>
<th></th>
<th>ProxPro® II</th>
<th>ProxPro® with Keypad</th>
<th>EntryProx™</th>
<th>MaxiProx®</th>
<th>Prox80™</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Base Model</strong></td>
<td>5455B/5458B</td>
<td>5355A/5352A/5358A</td>
<td>4045C</td>
<td>5375A</td>
<td>5405A/5408A</td>
</tr>
<tr>
<td><strong>Dimensions</strong></td>
<td>5.0” x 5.0” x 1.0” (12.5 cm x 12.5 cm x 2.5 cm)</td>
<td>5.25” x 2.75” x 1.37” (13.5 cm x 7.0 cm x 3.5 cm)</td>
<td>12.0” x 12.0” x 1.0” (30.5 cm x 30.5 cm x 2.5 cm)</td>
<td>3.15” x 3.15” x 0.8” (8.0 cm x 8.0 cm x 2.0 cm)</td>
<td></td>
</tr>
<tr>
<td><strong>Weight</strong></td>
<td>13.65 oz (387 g)</td>
<td>9.62 oz (273 g)</td>
<td>11.76 oz (333 g)</td>
<td>50.8 oz (1440 g)</td>
<td>2.2 oz (63 g)</td>
</tr>
<tr>
<td><strong>Read Range</strong></td>
<td>Up to 8.0” (20.5 cm)</td>
<td>Up to 3.0” (7.5 cm)</td>
<td>Up to 24.0” (61.0 cm)</td>
<td>Up to 5.5” (14.0 cm)</td>
<td></td>
</tr>
<tr>
<td><strong>Mounting</strong></td>
<td>Single-gang electrical box; Glass Mount Kit Available</td>
<td>US or EU single gang box, wall surface, or on glass with included adhesive pads</td>
<td>Mount on non-metallic surfaces for optimal read range performance.</td>
<td>EU/Asian single-gang box</td>
<td></td>
</tr>
<tr>
<td><strong>Power Supply</strong></td>
<td>5-16 VDC</td>
<td>10-28.5 VDC</td>
<td>10-15 VDC</td>
<td>12 VDC or 24 VDC</td>
<td>5-16 VDC</td>
</tr>
<tr>
<td><strong>Current Requirements</strong></td>
<td>25/125 mA</td>
<td>25/125 mA</td>
<td>150 mA</td>
<td>200/700 mA @ 12 VDC</td>
<td>20/115 mA @ 12 VDC</td>
</tr>
<tr>
<td><strong>Termination</strong></td>
<td>Pigtail</td>
<td>Pigtail or Terminal Strip</td>
<td>Pigtail</td>
<td>Pigtail</td>
<td></td>
</tr>
<tr>
<td><strong>Output Formats</strong></td>
<td>Wiegand or Clock-and-Data</td>
<td>Wiegand, Clock-and-Data, RS-232 or RS-422</td>
<td>Wiegand</td>
<td>Wiegand, Clock-and-Data, RS-232, RS-422 and RS-485</td>
<td>Wiegand or Clock-and-Data</td>
</tr>
<tr>
<td><strong>Tamper</strong></td>
<td>No</td>
<td>No</td>
<td>Switch</td>
<td>No</td>
<td></td>
</tr>
<tr>
<td><strong>Indoor/Outdoor</strong></td>
<td>IP55 Certified</td>
<td>IP55 Certified</td>
<td>IP55 Certified</td>
<td>IP55 Certified</td>
<td>IP55 Certified</td>
</tr>
<tr>
<td><strong>Warranty</strong></td>
<td>Lifetime</td>
<td>Lifetime</td>
<td>Lifetime</td>
<td>Lifetime</td>
<td>Lifetime</td>
</tr>
</tbody>
</table>
What Format Do You Need?

This is the question no one wants to ask or hear, but its answer is critical to program and order any credential.

What is a format?
A format is the structure of the data stored in an access control credential. Basically it is comprised of a set of binary digits – “bits” – put together in a certain way to create a binary number, which is converted into a credential number by an access control system. The number of ones and zeros, and how they are put together, determines the format and ultimately the credential number.

For example: A 26-bit format (H10301) is created like this 1-1111111-0001011111101100-1 with the first set of ones (in red) representing the site code and the second set of ones and zeros (in blue) representing the credential number. The access control system sees this format as card number 6124 with a site code 255. The 26-bit format is the most common format requested by dealers and can be used by most access control systems available today. However, there are many formats available and some formats are unique to access control systems and do not work with other formats at the same time. This is why it is so important to know the format when ordering credentials.

Here is some additional information about the 26-bit format (H10301) and other formats you may have come across:

HID 26-Bit Format: H10301
General: The 26-bit format (Format number H10301) is the industry standard format, and is an open format. The sale of this format is not limited to any one company. The range of credential numbers available in this format is limited, and therefore, the potential exists for credential numbers to be duplicated. It is important to understand that HID does not insure that credential numbers will not be duplicated. HID does not control or restrict the ordering of credentials programmed with the standard 26-bit format. Convenience in ordering credentials and universal access control panel acceptance are the primary benefits of using the standard 26-bit card format.

Description: The 26-bit format consists of 255 possible facility codes. Within each facility code, there are 65,535 unique card numbers.

Sales Policy: This format can be sold to any customer.

HID Proprietary 37-Bit Format: H10302
General: In an effort to provide an open format to the industry, while simultaneously assuring that the numbers are unique and will not be duplicated, the 37-bit format was developed. Under this format, HID controls the issuing of credential numbers and does not duplicate the numbers.

Description: The 37-bit format can be used to program a wide range of unique credential numbers. Although it is available to all customers, not all access control systems can handle such a large data length format. In addition, many systems are unable to handle a format that does not have a facility code.
Sales Policy: Just like the 26-bit format, the 37-bit format can be sold to any customer. Although it is available to all customers, HID controls the numbers generated for each order. Buyers must confirm that the system that the credentials are to be used on is capable of using a 37-bit number with no facility code.

HID Proprietary 37-Bit Format with Facility Code: H10304

General: The 37-bit format with facility code differs from the 37-bit format only in that it also contains a facility code. Just like the 37-bit format without facility code, this format provides the customer with an open format in which credential numbers will not be duplicated because HID tracks the credential manufacturing process to prevent duplication.

Description: This 37-bit format has 65,535 facility codes available and over 500,000 card numbers within each facility code. Just like the 37-bit format without facility code, many systems are not capable of handling a format as large as 37 bits. In addition, many systems are not capable of handling a facility code as large as 65,535.

Sales Policy: The 37-bit format with facility code is ideal for dealers who would like to have their own format. This allows them to have the security of no credential duplication, without dependence on a system supplier for a format. This format is reserved for customers with a requirement for a large population of credentials.

Corporate 1000 Format (see the Corporate 1000 page for more details)

General: The Corporate 1000 format is a 35-bit format designed to provide large end-users with their own proprietary format. This assures them that their credentials will not be duplicated because HID reserves an exclusive Corporate 1000 format for each end user. This format also provides the end-user the freedom to work with any system and with any dealer of their choice. Some access systems are not capable of handling a 35-bit format, but as a service to the customer, many OEM’s will make enhancements to their control systems to allow the use of an HID Corporate 1000 format. The end-user is offered the security and flexibility of selecting and authorizing the security dealer of his/her choice and controlling the issuance of credentials for the organization.

Description: The Corporate 1000 format is a 35-bit format with a unique Company ID Code and more than 1,000,000 available credential numbers.

Sales Policy: The Corporate 1000 format offers the end-user a large quantity of available credential numbers and is typically reserved for customers with the need or potential to badge a large number of cardholders. The Corporate 1000 format is also available to large, geographically diverse organizations with a requirement to unify the structure of their access control system around an exclusive access control card format under their control.

We hope these brief explanations help answer some of the questions you may have about formats. If you require further information, please contact us and we will work to clarify your understanding.
HID Proximity Credentials

**ProxCard® II**
Value priced 125 kHz proximity card
*Base Part Number* • 1326
- Price competitive with all other card technologies
- Thin enough to carry in a wallet or purse

**ISOProx® II**
125 kHz thin proximity card
*Base Part Number* • 1386
- Combines proximity technology and offers photo identification capability on a single card
- Graphics quality surface for use with direct image printers
- Same size and thickness as a standard credit card
- Vertical or horizontal slot punch capability

**DuoProx® II**
125 kHz thin proximity card with magnetic stripe
*Base Part Number* • 1336
- Combines proximity technology and offers photo identification capability on a single card
- Graphics quality surface for use with direct image printers
- Same size and thickness as a standard credit card
- Vertical or horizontal slot punch capability
- Magnetic stripe technology
- Thin enough to be used with standard swipe or insert readers

**Smart ISOProx® II**
125 kHz ISO-thin proximity card, contact smart chip embeddable (optional magnetic stripe)*
*Base Part Number* • 1597
- Allows a contact smart chip module to be embedded for multi-technology applications
- Graphics quality surface for use with direct image printers
- Smart DuoProx II includes magnetic stripe
- Same size and thickness as a standard credit card

* ISO 7816 compliant for embedding optional contact smart chip module. Some custom graphics can increase overall card thickness.
Smart DuoProx® II

125 kHz ISO-thin proximity card with magnetic stripe, contact smart chip embeddable *

Base Part Number • 1598

- Allows a contact smart chip module to be embedded for multi-technology applications
- Graphics quality surface for use with direct image printers
- Smart DuoProx II includes magnetic stripe
- Same size and thickness as a standard credit card

* ISO 7816 compliant for embedding optional contact smart chip module. Some custom graphics can increase overall card thickness.

MicroProx® Tag

125 kHz proximity adhesive tag

Base Part Number • 1391

- The size of a coin, the Tag easily attaches to all nonmetallic materials
- The Tag can be programmed in any HID proximity format, and is compatible with all HID proximity readers
- The Tag is RF-programmable for ease of encoding with HID’s ProxProgrammer®

Did you know? You can add a MicroProx Tag to a cellphone or PDA to create a secondary credential.

ProxKey® III

Convenient 125 kHz proximity key fob

Base Part Number • 1346

- Small enough to fit on a key ring
- Universal compatibility with HID proximity readers
- Dimensions: 1.56” x 1.25” x 0.24” (3.95 x 3.18 x 0.60 cm)
- Weight: 0.14 oz (4.0g)

ProxPass® II

Long range 125 kHz proximity active vehicle tag *

Base Part Number • 1351

- Active tag for vehicle access control
- Provides up to eight-foot read range
- Solely compatible with the MaxiProx® reader and all HID card formats
- One year warranty
- Replaceable battery
- Dimensions: 3.61” x 2.66” x 0.30” (91.6 x 67.5 x 7.6 mm)

* ProxPass II features a one-year warranty and has a 2-5 year battery life, depending on usage.
Did you know that most proximity, magnetic stripe and iCLASS credentials purchased from HID since Sept 1, 2003 have the sales order number printed on them?

The example below explains where to look and how to identify the sales order number on most credentials ordered today.

The benefits: The order identification number “Sales Order Number” enables us to help trace a past order placed with HID. This number is useful when customers need to place an order for a particular credential which requires information they may not have immediately on-hand. A call to the HID Global Customer Service at 800-872-5359 with this Sales Order Number allows us quickly to identify the style of credential including numbering (matching, non-matching, etc.), format*, site code and most importantly, the previously ordered credential numbers. So just remember this little bit of information the next time a customer comes in with a credential or calls you wanting to order something but does not know exactly what they need. With this simple printed Sales Order Number, you may have all the information you need.

ProxProgrammer®
Program proximity cards and tags ON DEMAND!

* Proprietary format unavailable

** HINT:** The order identification number “Sales Order Number” enables us to help trace a past order placed with HID. This number is useful when customers need to place an order for a particular credential which requires information they may not have immediately on-hand. A call to the HID Global Customer Service at 800-872-5359 with this Sales Order Number allows us quickly to identify the style of credential including numbering (matching, non-matching, etc.), format*, site code and most importantly, the previously ordered credential numbers. So just remember this little bit of information the next time a customer comes in with a credential or calls you wanting to order something but does not know exactly what they need. With this simple printed Sales Order Number, you may have all the information you need.

** COVER (FRONT)**

** BASE (BACK)**

12345 = Card ID Number

YYYYYYYY-YY = Sales order number

ProxCard® Plus
Wiegand and 125 kHz proximity card

Base Part Number • 169

- Combines Wiegand technology, proximity technology and photo identification capability on a single card
- Graphics quality surface for use with direct image printers
Multi-Technology Transition Cards

**iCLASS® Read/Write Contactless Smart Chip & Coil**
- **Operating Frequency:** 13.56 MHz read/write technology
- **Memory Size:** 2k bit (256 Byte) with two application areas, 16k bit (2k Byte) with two or 16 application areas, or 32k bit (4k Bytes) with two or 16 application areas plus an additional 16k application area
- **Read Range:** Up to 4.5” (11.4 cm) depending on local installation conditions and card reader selection
- **RF Interface:** As suggested by ISO/IEC 15693
- **Format:** Any proximity bit format up to 84 bits. For more information, use HID’s iCLASS Reference Guide or visit our website at www.hidglobal.com/iCLASS.

**Contact Smart Chip Module Guidelines**
For customers who require a contact smart chip module, HID has developed partnerships with the leading providers of application software and contact smart chip modules. Depending on your specifications, HID can embed contact smart chip modules from a number of industry leaders. When application software is needed, turn to HID’s partners. To learn more about HID’s smart card offerings and partners, visit our website at www.hidglobal.com/smart.

**MIFARE® Contactless Memory Chip and Coil**
- **Operating Frequency:** 13.56 MHz read/write technology
- **Memory Size:** 8k bit (1k Byte)
- **Read Range:** Up to 1.5” (3.8 cm) depending on local installation conditions and card reader selection.
- **RF Interface:** As suggested by ISO/IEC 14443, Type A
- **Fixed Serial Number:** Unique 32 bit.
For more information, use HID’s MIFARE Reference Guide or visit our website at www.hidglobal.com.

---

**iCLASS® Prox Card**
- **13.56 MHz iCLASS contactless smart card and 125 kHz proximity thin card**
- **Base Part Number:** 202
  - 13.56 MHz iCLASS read/write technology and HID 125 kHz proximity technology in a single ISO standard thickness card
  - Enables contactless smart card applications to be added to an existing HID proximity technology access control system
  - Offers the ability to add a magnetic stripe, barcode, anti-counterfeiting feature, custom artwork, or photo ID
  - Meets ISO standards for thickness for use with direct image and thermal transfer printers

**MIFARE®/Prox Card**
- **125 kHz thin proximity & 13.56 MHz MIFARE® card (optional magnetic stripe)**
- **Base Part Number:** 1431
  - Combine MIFARE 1K and HID proximity technologies to add smart card applications, such as cashless vending, corporate and campus applications, event ticketing, customer loyalty and photo ID cards, to access control systems
  - Provides high security with mutual authentication, data encryption and unique 32-bit serial number and supports all HID proximity card formats, including Corporate 1000
  - Photo ID compatibility allows printing directly to the card with a direct image or thermal transfer printer
  - Cards can be produced with visual security and anti-counterfeiting features such as holograms, ultra-violet fluorescent inks, micro-printing or a custom logo
  - Also Available in Composite Polyester / PVC and MIFARE 4K versions
## HID Proximity Credentials

<table>
<thead>
<tr>
<th></th>
<th>ProxCard® II</th>
<th>ISOProx® II</th>
<th>DuoProx® II</th>
<th>Smart ISOProx II™</th>
<th>Smart DuoProx® II</th>
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</thead>
<tbody>
<tr>
<td><strong>Base Part Number</strong></td>
<td>1326</td>
<td>1386</td>
<td>1336</td>
<td>1597</td>
<td>1598</td>
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### Read Range: *

<table>
<thead>
<tr>
<th>Model</th>
<th>Read Range:</th>
</tr>
</thead>
<tbody>
<tr>
<td>ProxPoint® Plus</td>
<td>Up to 3.0” (7.5 cm)</td>
</tr>
<tr>
<td>MiniProx®</td>
<td>Up to 5.5” (14.0 cm)</td>
</tr>
<tr>
<td>Thinline® II</td>
<td>Up to 5.5” (14.0 cm)</td>
</tr>
<tr>
<td>ProxPro®</td>
<td>Up to 8.0” (20.5 cm)</td>
</tr>
<tr>
<td>ProxPro® II</td>
<td>Up to 9.0” (23.0 cm)</td>
</tr>
<tr>
<td>MaxiProx®</td>
<td>Up to 29.0” (74.0 cm)</td>
</tr>
<tr>
<td>EntryProx™</td>
<td>Up to 3.0” (7.5 cm)</td>
</tr>
<tr>
<td>Prox80™</td>
<td>Up to 5.5” (14.0 cm)</td>
</tr>
</tbody>
</table>

### Memory Size/ Application Area

- **N/A**

### HID Proximity 125 kHz

- **Yes**

### Contact Smart Chip Module Embeddable

- **Yes**

### Wiegand Strip

- **No**

### Magnetic Stripe

- **No**

### Printable ***

- **Yes**

### Standard HID Artwork

- **Optional**

### Slot Punch

<table>
<thead>
<tr>
<th></th>
<th>Vertical (standard)</th>
<th>Horizontal or Vertical Optional</th>
<th>Vertical Optional</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
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</table>

### Visual Security Options

<table>
<thead>
<tr>
<th></th>
<th>N/A</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Additional Security Options

<table>
<thead>
<tr>
<th></th>
<th>Corporate 1000</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Warranty

<table>
<thead>
<tr>
<th></th>
<th>Lifetime</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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* Dependent upon installation conditions.

** Contact smart chip module not included. Ask about HID's SMARTS Program for off-the-shelf contact smart chip embedded cards.

*** Some types of printing processes can take these credentials out of ISO compliance for thickness. Consult factory for more information.
## Comparison Chart

<table>
<thead>
<tr>
<th>iCLASS® Prox</th>
<th>MIFARE®/Prox</th>
<th>ProxCard® Plus</th>
<th>ProxKey® III</th>
<th>MicroProx® Tag</th>
<th>ProxPass® II</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>202X/212X; 203X/213X</td>
<td>1431</td>
<td>169</td>
<td>1346</td>
<td>1391</td>
<td>1351</td>
</tr>
<tr>
<td></td>
<td>Up to 2.5” (6.5 cm)</td>
<td>Up to 1.0” (2.5 cm)</td>
<td>Up to 1.5” (4.0 cm)</td>
<td>Up to 2.0” (5.0 cm)</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td>Up to 5.0” (12.5 cm)</td>
<td>Up to 2.0” (5.0 cm)</td>
<td>Up to 2.5” (6.5 cm)</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td>Up to 5.0” (12.5 cm)</td>
<td>Up to 1.5” (4.0 cm)</td>
<td>Up to 2.0” (5.0 cm)</td>
<td>Up to 3.0” (7.5 cm)</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td>Up to 7.0” (18.0 cm)</td>
<td>Up to 3.0” (7.5 cm)</td>
<td>Up to 4.0” (10.0 cm)</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td>Up to 8.0” (20.0 cm)</td>
<td>Up to 4.0” (10.2 cm)</td>
<td>Up to 4.5” (11.5 cm)</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td>Up to 20.0” (51.0 cm)</td>
<td>Up to 13.0” (33.0 cm)</td>
<td>Up to 12.0” (28.0 cm)</td>
<td>Up to 15.0” (38.0 cm)</td>
<td>Up to 8.0” (2.5 m)</td>
</tr>
<tr>
<td></td>
<td>Up to 2.5” (6.5 cm)</td>
<td>Up to 1.0” (2.5 cm)</td>
<td>Up to 1.5” (4.0 cm)</td>
<td>Up to 2.0” (5.0 cm)</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td>Up to 5.0” (12.5 cm)</td>
<td>Up to 1.5” (3.5 cm)</td>
<td>Up to 2.0” (5.0 cm)</td>
<td>Up to 2.5” (6.0 cm)</td>
<td>N/A</td>
</tr>
</tbody>
</table>

### Memory Size/Application Area

- **N/A**
- **2k bits with two application areas; 16k bits with two application areas, 1k6 bits with 16 application areas; 32k bits (16k/2+16k/1), 32k bits (16k/16+16k/1)**
- **MIFARE 1K: 1K Byte (8k bits) in 16 64-byte Sectors**
- **MIFARE 4K: 4K Byte (32k bits) in 40 Sectors: 32 sectors of 64 bytes, 8 sectors of 256 bytes.**

### Optional**

<table>
<thead>
<tr>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Yes</td>
<td>No</td>
</tr>
</tbody>
</table>

### Additional Security Options

<table>
<thead>
<tr>
<th>Corporate 1000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lifetime</td>
</tr>
</tbody>
</table>
HID’s Corporate 1000 Program gives security professionals the ability to standardize on a “Single Card Solution,” providing timely and educational information to end-users regarding the securing of people, property and assets. This program insures that advanced RFID technological solutions continue to be developed to meet the demands of ever-changing dynamics in the workplace.

HID’s Corporate 1000 program allows companies to standardize on one card for their access control systems. See below for answers to common questions.

**HID Corporate 1000 Program
Frequently Asked Questions**

1. **What is the HID Corporate 1000 Program?**
The Corporate 1000 Program allows HID to provide end-user customers with a 35-bit card format that is developed specifically for each individual end-user customer. Within this program, HID can provide the end-user with just over 1,000,000 individual card numbers within the assigned format. Card numbers are tracked in the manufacturing process to ensure that card numbers are not duplicated.

2. **What are the benefits of the Corporate 1000 Program?**
- Security of the card and associated data is increased due to the customized 35-bit format that is proprietary to each individual end-user.
- HID tracks card number sequences to prevent card number duplication; the end-user is guaranteed that the card can be used on standard HID proximity card readers throughout the world. Individual employees can carry just one card to gain access to any facility in which they have been authorized. In addition, the end-user may order cards from multiple sources (as designated by the end-user) and be guaranteed that card number duplication will not occur.
- Due to the size of the available card population, the end-user is assured that cards in the desired format will be available for years to come.
- The end-user is free to choose the access control hardware/software platform that best meets the needs of individual sites, while insuring that the same HID reader and card can be used. This provides the end-user with maximum flexibility in choosing the access control system and integrator/dealer that best meets their requirements. The common component is the HID reader and card.
- The end-user has the flexibility to choose the vendor(s) that they wish to purchase cards from at any time. The end-user may choose to have one source of supply or many.
3. Does my company qualify to participate in the Corporate 1000 Program?

Most end-users who request a Corporate 1000 Format are accepted into the Program. Although HID doesn’t have a formal list of qualifications to participate in the Corporate 1000 Program, HID wants to insure that Program participants will receive a high level of value from using a Corporate 1000 Format.

Those who receive value from this format include:

• End-users with multiple locations and/or decentralized decision making on card purchases.
• End-users with card and/or reader populations that are large (or are expected to grow over time). The lead-time for card delivery is not impacted by use of the Corporate 1000 Format. No matter which HID format is used, lead times are based on the card to be purchased.

4. How long does it take to establish a Corporate 1000 Format?

Once the completed Corporate 1000 Request and Authorization Form is received by HID, it will take up to five (5) working days to establish the format. The end-user and the sponsoring system integrator/dealer or OEM will receive the assigned format number and a copy of the format via FedEx® from HID.

5. Are there any costs associated with participating in the Corporate 1000 Program?

There is no charge for development of the Corporate 1000 Format and initial set-up of the end-user in the Program. Once you determine that you wish to participate in the Program, you will complete the authorization forms and return them to HID. The end-user’s systems integrator/dealer is charged a nominal fee for card management and card number tracking by HID. Please check with your systems integrator/dealer to determine what impact, if any, this will have on your card purchase price.

6. How do I enroll to participate in the Corporate 1000 Program?

To enroll in the program, simply complete the Corporate 1000 Format Request Form and the Corporate 1000 Change and Authorization Form. These forms are available on the HID website at www.hidglobal.com.

If you need assistance completing the form, please contact HID at (949) 598-1600 or (866) 607-7339.
7. Can the Corporate 1000 Format be programmed into any HID proximity card?
The assigned Corporate 1000 Format can be programmed into any HID card or key fob. Please consult the How To Order Guide on HID’s website or check with your systems’ integrator/dealer to determine which proximity credential best meets your needs.

8. Is there a specific part number associated with the use of the Corporate 1000 Format?
There is no special part number. When ordering cards, order the part number for the card you want. Then, simply indicate that the cards are to be programmed in Corporate 1000 Format HXXXXX, using the next number up. (The Corporate 1000 Format number, HXXXXX, will be a letter and five numbers. This will be assigned once your individual Corporate 1000 Format is established.)

The HID direct customer who is ordering the cards will be aware of the need to put a separate line item on their P.O. that is associated with programming the cards in the Corporate 1000 Format.

9. The end-user is currently using HID proximity technology but with another bit format. Will the existing cards be compatible with the Corporate 1000 Format?
When using HID cards in a bit format other than the 35-bit format, you have the option of replacing all cards at one time or transitioning into the program. The existing cards will not be compatible with the Corporate 1000 Format unless reprogrammed.

If you choose to transition into the program, there are a few constraints of which you need to be aware:

• At an existing site that is using a card format other than a 35-bit format, it is important to determine if the existing access control hardware/software platform has the ability to manage multiple card formats simultaneously. In other words, can the system manage two or more bit formats simultaneously? If not, any system users with access to the site would need to be: (1) re-badged with a card in the new format; or (2) the access control hardware/software platform would need to be upgraded to allow for the use of multiple bit formats simultaneously.

• At any site, it is important to verify that the access control hardware/software being used or proposed for use can manage a 35-bit card format. There are some older platforms in use that do not have this capability. There are also an extremely limited number of newer platforms with similar limitations.

• If the existing system can handle multiple formats, it is also imperative that you confirm that the system can handle the same card number within multiple formats.
10. With Card Number 100 and a 26-bit format with Card Number 100, will the system “see” the two cards as different numbers?

Many systems “see” cards in different formats with the same number. If this is the case, identify the highest card number used on the existing system. HID will then block these numbers from being used to ensure that the card numbers do not appear to be duplicates.

11. Why does HID ask me to provide a card start number? Why would I use any number other than the number 1?

If you plan to use two or more bit formats simultaneously on the same access control hardware/software configuration, there may be an issue with duplicate card numbers.

For example, assume that the current format in use is a 26-bit format with a facility code of 100. The existing card numbers in use range from 1 to 20,000. The plan is to transition to a 35-bit format over time. This means that the existing hardware/software configuration will be reading and managing two bit formats simultaneously.

Two cards are to be entered into the system. These are:
• A 26-bit format card, facility code 100, and card number 25
• A 35-bit format card, company ID code 150, and card number 25

It is possible that the access control hardware/software configuration will report both of these cards as card number 25. Although the cards have different bit formats and facility/company ID codes, the system may not differentiate based on the same card number being used. For this reason, many end-users choose to start their card numbering above the highest card number currently in use. If you are not sure of the highest card number in use and a 26-bit format is in use, it is safe to use a card start number of 66,000.

12. I have other technical questions not answered here. What should I do?

You may call HID at (866) 607-7339 and ask for Technical Support.
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Fax: +1 949 732 2360

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Col. Jardines del Moral
Leon 37160, Mexico
Tel: +52 (55) 5081 1650

hidglobal.com
AEB8
Alarm Expansion Board with Eight (8) Additional Line Module Inputs

- **MODULAR**
  Up to 40 expansion inputs (intrusion detection, fire doors, windows)

- **HIGH PERFORMANCE**
  Less than two (2) second response time with contact, tamper, motion, and line supervision

- **SIMPLE**
  Use with any Hirsch end-of-line module (MELM 1, 2, or 3)

Identiv’s Alarm Expansion Board (AEB8) expands the line module input capacity of a controller. AEB8 provides an additional eight (8) line module inputs per board.

Expansion line module inputs are used for a variety of security monitoring functions. In intrusion detection applications, they typically monitor interior motion sensors and perimeter doors and windows for forced entry or intrusion into a protected area; however, they are generally not employed for door access control applications.

The new model AEB8 has four (4) address jumpers, whereas the previous model only possessed two. Each jumper allocates a range of eight (8) addresses. This addressing scheme enables up to four (4) AEB8s to reside in one controller. For the Hirsch M16 - which features 16 inputs on the base controller board - two additional AEB8s can be added to the controller for a total of 32 inputs.

**Line modules are a necessary component of the input circuits from a controller.** In addition to providing supervision of the wiring from a controller, the line module also supports a request to exit (RQE) input and a tamper input. Line modules provide supervision by indicating when a circuit is shorted, opened, noisy and/or out-of-spec. These conditions are typically considered attempts to breach the security of a system and are therefore monitored and reported on an input-by-input basis at all times for enabled inputs. The controller digitally processes the analog measurement of the circuit resistance at an effective rate of 10 times per second. The circuit measures variation in conditions (±2% with the MELM 3 line module) then reports any appropriate alarms upon detection.

Please contact your Identiv regional manager to arrange for a web discussion and demo by calling +1-888-809-8880, emailing sales@identiv.com, or visiting identiv.com.
### Specifications

<table>
<thead>
<tr>
<th>PARAMETER</th>
<th>AEB8</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Communications</strong></td>
<td></td>
</tr>
<tr>
<td>Wiring from Controller</td>
<td>One (1) pair twisted shielded</td>
</tr>
<tr>
<td>Supervision</td>
<td>± 2% with MELM 3</td>
</tr>
<tr>
<td><strong>Physical</strong></td>
<td></td>
</tr>
<tr>
<td>Alarm</td>
<td>Physical tamper on panel enclosure</td>
</tr>
<tr>
<td>Dimensions</td>
<td>6.85 x 4.05 x .52 in (17.4 x 10.3 x 1.32 cm)</td>
</tr>
<tr>
<td>Shipping Weight</td>
<td>1 lb (0.45 kg)</td>
</tr>
<tr>
<td>Operating Temperature Range</td>
<td>32° to 140°F (0° to 60°C)</td>
</tr>
<tr>
<td>Relative Humidity</td>
<td>0 to 90%, non-condensing</td>
</tr>
<tr>
<td>Listings and Approvals</td>
<td>• UL-294, UL-1076</td>
</tr>
<tr>
<td></td>
<td>• CE</td>
</tr>
</tbody>
</table>
Identiv’s Hirsch Mx Controller is available in 2, 4, and 8-door models, with each door being fully supervised. The modular design and the scalable architecture of the Mx Controller enables an installation to start small and expand as needed, from a single controller system to a larger, multi-site enterprise.

The Mx Controller is fully firmware, function, and communication protocol compatible to Identiv’s DIGI*TRAC line of controllers. The Mx Controller is designed to seamlessly integrate with existing systems, so that existing credentials, readers, and user databases can be retained. The Mx Controller is the core of Identiv’s physical access control system (PACS), and is designed for use with Identiv’s Hirsch Velocity™ Software security management system, uTrust TS Readers, Hirsch ScramblePad®, ScrambleProx®, ScrambleSmartProx®, and secure keypads.

A range of models and expansion options in the Mx and DIGI*TRAC product lines provide a variety of access control, high-security alarm monitoring, relay control outputs, and programmable logic configurations to fit most applications.

With the Mx Controller at its core, Identiv’s PACS provides a high-integrity, enterprise-class access control and security management solution.

**Mx Modular Controller Features**

- Controls 2, 4, or 8 fully supervised doors with entry and optional exit keypads/readers:
  - Field upgradeable from 2 to 4, 2 to 8, or 4 to 8 doors
- Scalable from single controller to networked multi-site installations
- Multi-microprocessor architecture with dedicated Crypto-processor
- Integrated network communication with onboard Ethernet IP port
- Dedicated alarm relay outputs
- Integrated hardware encryption with enabled devices
- High security supervised alarm inputs
- Configurable relay outputs (door or general purpose in Velocity)
- Bay for up to 5 expansion boards:
  - Memory (up to 132,000 users)
  - Alarms expansion (max. 4)
  - Relays expansion (max. 5)
- MATCH Protocol:
  - ScramblePads and MATCH2 interfaces
  - For extended cable runs
  - For entry/exit reader setup
- Wiegand entry reader connectivity for each door
- Wiegand setup via Velocity
- Multi-drop global I/O using RS485
- Firmware can be updated through Velocity
- Supports a wide variety of readers and credentials
As an access control system, the Mx Controller includes extensive onboard firmware for control sequences as basic as “who goes where and when” to sophisticated functions like the two-person rule, occupancy counting, individual user tagging, door interlocking, and anti-passback. Full functionality is maintained even when Hirsch Velocity is not available (i.e., during a network outage). Access may be restricted based on time of day, day of week, and door. Access may be granted when the user presents the correct PIN code, card, or both. The user may be granted temporary access based on: use count limits, temporary day limits, and absentee rule limits, with auto-disable or auto-delete on expiration of temporary users.

Additional functions include unlock/relock, alarm mask/unmask, and lock down/lock down release. The associated door may be monitored for door forced open and door open too long, while providing auto relock control. While the standard Mx Controller has an extensive array of options, there are many custom features that are available through Identiv Global Services. These options range from integration with time and attendance systems to PKI certificate authentication services.

Readers and keypads supported include uTrust TS Readers, Hirsch ScramblePad, ScrambleProx, ScrambleSmartProx, and many other technologies, including magnetic stripe, smart card (i.e., DESFire, MIFARE, PIV, or PIV-I), proximity, bar code, RF, IR, and biometric. Technologies may be combined on the same controller or the same door in many different combinations.

High Security Input Monitoring
Identiv uses very stable digitally processed analog inputs with line supervision for high-security input monitoring. A line supervision module is located at the door contact, alarm sensor, request to exit (RQE/REX), or similar device to establish this supervision. Conditions reported include alarm, secure, RQE, mask, tamper alarm, tamper secure, short, open, noisy, and input-out-of-spec. This provides significant advantages over traditional error-prone, environment-sensitive analogue wiring back to controllers.

Relay Control System
Relay outputs on Mx Controllers can be used for electric door locks and strikes, arming/disarming security systems, alarm annunciation, elevator floor control, HVAC control, lighting control, storage locker control, and many other equipment control applications. These relays may be activated by codes (via the ScramblePad family), cards (via reader), time zones, alarms, or logic sequences linked to other relays. Mx Controllers are also ideal for after-hours tenant override systems. A history of who issued the override command is available for tenant billing or audit trails. The same reader or keypad used for access control can be used for tenant override and remote operator command functions.

Reliability by Design
Mx Controllers are designed for high availability as a complete system for global markets. Standby batteries for both memory and system operation are standard. The controller ships with an internal switching power supply. All door relays are socketed and replaceable. All keypad/reader terminals and power circuits are fused and are onboard resettable. Each unit is configured in a heavy duty, NEMA style enclosure, with lock and tamper alarm.

<table>
<thead>
<tr>
<th>PARAMETER</th>
<th>HIRSCH MX CONTROLLER</th>
</tr>
</thead>
<tbody>
<tr>
<td>Serial Interface Ports</td>
<td>Controller to controller:</td>
</tr>
<tr>
<td></td>
<td>• RS-485 multi-drop protocol (X<em>NET2/X</em>NET3)</td>
</tr>
<tr>
<td></td>
<td>• Optically isolated port</td>
</tr>
<tr>
<td></td>
<td>• Up to 4,000 ft (1,200 m) with 22 gauge, 2 pair, twisted, and shielded</td>
</tr>
<tr>
<td></td>
<td>Controller to server:</td>
</tr>
<tr>
<td></td>
<td>• 10/100 Ethernet (TCP/IP)</td>
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<tr>
<td></td>
<td>• Encrypted communication</td>
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<tr>
<td>MATCH Protocol</td>
<td>24V DC nominal</td>
</tr>
<tr>
<td>Reader Support</td>
<td>ScramblePad/MATCH2:</td>
</tr>
<tr>
<td></td>
<td>• Proprietary MATCH protocol</td>
</tr>
<tr>
<td></td>
<td>• Keypad/reader ports: 8 with 16 device addresses (8 entry and 8 exit)</td>
</tr>
<tr>
<td></td>
<td>• Maximum wiring run: 750 ft (230 m) with 22 gauge or 1,800 ft (550 m) with 18 gauge, 2</td>
</tr>
<tr>
<td></td>
<td>pair, twisted, overall shield</td>
</tr>
<tr>
<td></td>
<td>Onboard MATCH:</td>
</tr>
<tr>
<td></td>
<td>• Industry standard Wiegand</td>
</tr>
<tr>
<td></td>
<td>• Keypad/reader port: 8 using Mx device address 1 - 8</td>
</tr>
<tr>
<td></td>
<td>• Maximum wiring run: 500 ft (150 m) with 18 gauge, 2 pair, twisted, overall shield</td>
</tr>
<tr>
<td>PARAMETER</td>
<td>HIRSCH MX CONTROLLER</td>
</tr>
<tr>
<td>------------------------------------------------</td>
<td>----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
</tbody>
</table>
| Dial-Up to Remote Host                         | • Phone numbers: Four with roll over  
| (External SNIB Required)                       | • User-selectable retry attempts  
|                                               | • Call-back mode for security  
|                                               | • Initiation by alarm, buffer percent full, and/or time                                                                                                                                                               |
| Industry Standard Wiegand Devices             | Login to computer, websites, and SaaS services with a digital certificate or OATH-based OTP                                                                                                                                 |
| Command and Control Module (CCMx)             | • Removable and upgradeable  
|                                               | • CCM upgrades through Velocity  
|                                               | • CCM updates all microprocessors (including onboard MATCH)  
|                                               | • Time zones: 150  
|                                               | • Door groups: 128  
|                                               | • Control zones: 256  
|                                               | • Holiday schedules: 4 (366 days x 2 years)  
|                                               | • Daylight savings time adjustment                                                                                                                                                                                  |
| Public Private Key Processor and Secure Digital Key Vault | Global platform compatible and secure storage of key material                                                                                                                                                           |
| Buffers                                        | • Standard: 1,500 events and 1,500 alarms  
|                                               | • MEB/CB128 (reduces users by 20%) or MEB/BE: 20,000 events and 2,000 alarms  
|                                               | • If buffer is full, oldest information is discarded first                                                                                                                                                           |
| Users                                          | • Standard: 4,000  
|                                               | • MEB/CB128: 132,000                                                                                                                                                                                                |
| Memory Protection Battery                      | 30 days for code, setups, clock, and buffers                                                                                                                                                                            |
| Security                                       | • Enclosure door tamper switch  
|                                               | • Key lock                                                                                                                                                                                                         |
| Enclosure                                      | NEMA type with conduit knockouts and removable door                                                                                                                                                                    |
| Dimensions                                     | 18 x 15.25 x 5.5 in (457 x 387 x 140 mm)                                                                                                                                                                               |
| Weight                                         | 30 lbs (13.6 kg)                                                                                                                                                                                                       |
| Expansion Boards                               | 6 x 4.25 x 0.75 in (152 x 108 x 19 mm) and 1.0 lb (0.45 kg)                                                                                                                                                            |
| Operating Temperature Range                    | 32° to 140°F (0° to 60°C)                                                                                                                                                                                              |
| Relative Humidity                              | 0 to 90%, non-condensing                                                                                                                                                                                               |
| Keypad/Reader Power (8 Terminals)              | • 1.0 Amp at 24VDC each, fused and resettable  
|                                               | • 2.9 Amp at 24VDC each  
|                                               | • Powers ScramblePads and MATCH2                                                                                                                                                                                      |
| Wiegand Keypad/Reader (8 Terminals)            | • 500 mA at 12VDC each, fused and resettable  
|                                               | • 2.0 Amp at 12VDC total  
|                                               | • Powers standard PACS readers                                                                                                                                                                                          |
| Power Supply                                   | • Switching  
|                                               | • 110 - 240 VAC, 50/60, fused                                                                                                                                                                                           |
| Standby Batteries                              | 7 AH included                                                                                                                                                                                                        |
| Door Relays                                    | 5 Amp, form C                                                                                                                                                                                                         |
| Alarm Relays                                   | 2 Amp, form C                                                                                                                                                                                                          |
| Listings and Approvals                         | • UL 294: Access Control Systems Units  
|                                               | • UL 1076: Proprietary Burglar Alarm Systems                                                                                                                                                                           |
### Ordering Information for Mx Controllers

<table>
<thead>
<tr>
<th>PART NUMBER (PID)</th>
<th>PRODUCT</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>MX-2</td>
<td>Model Mx-2 controller, for up to 2 doors</td>
<td>Controls 2 Supervised Doors. 4,000 Users. Includes 2 door relays, 2 Alarm Inputs (requires Line Modules), enclosure, power supply, battery, tamper switch, key lock, and integrated SNIB3. Supports Expansion Boards. 110-240 VAC.</td>
</tr>
<tr>
<td>MX-4</td>
<td>Model Mx-4 controller, for up to 4 doors</td>
<td>Controls 4 Supervised Doors. 4,000 Users. Includes 4 door relays, 4 Alarm Inputs (requires Line Modules), enclosure, power supply, battery, tamper switch, key lock, and integrated SNIB3. Supports Expansion Boards. 110-240 VAC.</td>
</tr>
<tr>
<td>MX-8</td>
<td>Model Mx-8 controller, for up to 8 doors</td>
<td>Controls 8 Supervised Doors. 4,000 Users. Includes 8 door relays, 8 Alarm Inputs (requires Line Modules), enclosure, power supply, battery, tamper switch, key lock, and integrated SNIB2. Supports Expansion Boards. 110-240 VAC.</td>
</tr>
</tbody>
</table>

### Ordering Information for Expansion Boards

<table>
<thead>
<tr>
<th>MODEL</th>
<th>DESCRIPTION</th>
<th>COMMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>AEB8</td>
<td>Alarm Expansion Board with 8 Inputs</td>
<td>Adds 8 additional high security alarm inputs. Velocity supports up to 5 boards. Each input requires an appropriate Line Module. Features removable connectors.</td>
</tr>
<tr>
<td>REB8</td>
<td>Relay Expansion Board with 8 Relays</td>
<td>Adds additional 2 Amp Form C relays. Up to five (5) REB8s per controller. Status LEDs and removable connectors.</td>
</tr>
<tr>
<td>MEB/BE</td>
<td>Memory Expansion Board – Buffer Expansion</td>
<td>Expands standard buffer from 1,500 events and 1,500 alarms to 20,000 events and 2,000 alarms. Protected from data loss during power failures for up to 30 days by controller memory battery.</td>
</tr>
<tr>
<td>MEB/CB128</td>
<td>Memory Expansion Board – CODE Expansion of 128,000 with Buffer Option</td>
<td>Expands CODE Memory by 128,000 (from 4,000 to 132,000) credentials. A portion of the Code Memory may be allocated to alarm and event buffers, which will reduce the number of users. Protected from data loss during power failures for up to 30 days by controller memory battery. (Limited Availability. Use MEB/CB64 or MEB/CB128.)</td>
</tr>
<tr>
<td>SNIB3</td>
<td>Secure Network Interface Board 3</td>
<td>Networks DIGI*TRAC controller to PC (with Velocity Version 3.6 SP1 or later only) via 10/100/1000 Ethernet (TCP/IP). Optically isolated RS-485 port for multi-drop between SNIB2s at baud rates up to 115K Bps. Supports AES (128 and 256 bit Rijndael) encryption between host PC and Master SNIB3 and between Master SNIB3 and downstream SNIB2 or SNIB3. Master SNIB3 supports integral XBox functionality for globalization. Supports IPv6, DHCP and second network port for future use, FICAM enabled. UL listed.</td>
</tr>
<tr>
<td>RREB RS-485</td>
<td>Reader Expansion Board RS-485</td>
<td>Reader Expansion Board (RREB) provides OSDP communication with up to 16 readers across 8 doors for processing PN/PV-VCIV credentials at time of access in compliance with FICAM.</td>
</tr>
</tbody>
</table>
Identiv Alarm Line Modules provide high-security line supervision and alarm masking functionality to DIGI*TRAC™ controllers.

**Features**
- High Security Alarm Inputs
- 2% Line Supervision
- MELM May Be Located within Sensor
- Monitors up to three Discrete Inputs
  - Alarm or Door Status
  - Alarm Masking or Request-to-Exit (RQE)
  - Tamper Alarm, Tamper Secure
- Mask
- Line-Out-of-Spec
- Tampering
- Latch Monitor (Option)

For doors with access control, both monitoring and alarm notification are provided for:
- Door Forced Open
- Door Open Too Long
- Auto Re-Lock Status

**Description**
Identiv DIGI*TRAC controllers use very stable digitally processed analog inputs with 2% line supervision for high security alarm monitoring. A line supervision module (DTLM, MELM, or SBMS) is located at the door contact, alarm sensor, request-to-exit (RQE), or similar device to establish this supervision.

In lieu of “shunting”, which turns off supervision, Identiv uses “alarm masking” for full-time supervision and reporting of line status — even during hours of authorized access. Conditions reported include:
- Alarm
- Short
- Secure
- Open
- RQE
- Noise

**Specifications**

**Electrical**
- Input 1: N.O. or N.C. (Alarm)
- Input 2: N.O. (RQE)
- Input 3: N.C. (Tamper- or Latch Monitor Option with CCM7.1x)
- Total Impedance: 10 Ohm maximum for alarm device contacts and cable
- Wiring Distances to DIGI*TRAC for 22 gauge twisted shielded pair:
  - DTLM1/MELM1: 5490 ft (1673 m)
  - DTLM2/MELM2: 3000 ft (914 m)
  - DTLM3/MELM3: 925 ft (282 m)

**Physical**
- Dimensions:
  - DTLM1: 2-1/8 x 1-3/8 x 3/8 in (5.5 x 3.5 x 1.1 cm) each
  - DTLM2: 2-7/8 x 1-1/2 x 3/8 in (7.5 x 3.7 x 1.1 cm) each
  - DTLM3: 3-5/8 x 1-1/2 x 3/8 in (9.3 x 3.7 x 1.1 cm) each
  - MELM1: 1 x 1/2 in (2.5 x 1.3 cm) each
  - MELM2: 1 x 1/2 in (2.5 x 1.3 cm) each
  - MELM3: 1 x 1/2 in (2.5 x 1.3 cm) each
  - SBMS3: 4-1/4 x 1-1/2 x 3/4 in (10.8 x 3.8 x 1.9 cm) each, with 3 ft (92 cm) armored cable.

**Shipping Weight:**
- DTLM1: 1lb (0.45 kg)
- DTLM2: 1lb (0.45 kg)
- DTLM3: 1lb (0.45 kg)
- MELM1: 1lb (0.45 kg)
- MELM2: 1lb (0.45 kg)
- MELM3: 1lb (0.45 kg)
- SBMS3: 2lb (0.9 kg)

**Operating Temperature Range:**
32° to 140° F (0° to 60° C)

**Relative Humidity:**
0 to 90% non-condensing

**Listings and Approvals**
- UL 294 (ALVY) Access Control Systems Units
- UL 1076 Proprietary Burglar Alarm Systems Grade AA
**Typical Controller-to-Line Module Wiring Diagram**

### Ordering Information

<table>
<thead>
<tr>
<th>Model</th>
<th>Description</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>DTLM1</td>
<td>DIGI*TRAC Line Module 1</td>
<td>One input for Alarm/Door monitoring. Enables Auto-Relock function on a door. Consists of MELM1 prewired to one side of a two row terminal block. Locate at door or device supervised.</td>
</tr>
<tr>
<td>DTLM2</td>
<td>DIGI*TRAC Line Module</td>
<td>Two inputs for Alarm/Door monitoring and alarm mask/RQE. Enables Auto-Relock function on a door. Consists of MELM2 prewired to one side of a two row terminal block. Locate at door or device supervised.</td>
</tr>
<tr>
<td>DTLM3</td>
<td>DIGI*TRAC Line Module 3</td>
<td>Three inputs for Alarm/Door monitoring, alarm mask/RQE and tamper. Enables Auto-Relock function on a door. Consists of MELM3 prewired to one side of a two row terminal block. Locate at door or device supervised.</td>
</tr>
<tr>
<td>MELM1</td>
<td>Miniature Embedded Line Module 1</td>
<td>One input for Alarm/Door monitoring. Enables Auto-Relock function on a door. Includes 12-inch color coded flying leads. For installation within the body of most alarm sensors. Locate at door or device supervised.</td>
</tr>
<tr>
<td>MELM2</td>
<td>Miniature Embedded Line Module 2</td>
<td>Two inputs for Alarm/Door monitoring and alarm mask/RQE. Enables Auto-Relock function on a door. Includes 12-inch color coded flying leads. For installation within the body of most alarm sensors. Locate at door or device supervised.</td>
</tr>
<tr>
<td>MELM3</td>
<td>Miniature Embedded Line Module 3</td>
<td>Three inputs for Alarm/Door monitoring, alarm mask/RQE and tamper. Enables Auto-Relock function on a door. Includes 12-inch color coded flying leads. For installation within the body of most alarm sensors. Locate at door or device supervised.</td>
</tr>
<tr>
<td>SBMS3-2707A</td>
<td>Supervised Balanced Magnetic Switch with Line Module 3</td>
<td>Sentrol #2707A-L14 with integral MELM3. High-Security triple-biased door contact combines 2% multistage line supervision, RQE and TAMPER on a single pair of shielded wires. UL Listed for vaults and safes. Aluminum housing, 3ft armored cable. 3/16- to 5/8-inch gap. Includes Tamper plate.</td>
</tr>
</tbody>
</table>

**Note:** 2% line supervision is available on DTLM3/MELM3. DTLM1/MELM1 and DTLM2/MELM2 provide 4% line supervision.

Technical data is subject to change without notice.
Pendant transmitters

Through superior range and reliability, Inovonics EchoStream pendants offer virtually limitless opportunities for real world applications. Worn on a necklace, belt clip, wristband, or mounted in a fixed location, these lightweight, versatile pendants can be adapted to a wide range of installations.

Pendant transmitters can be fully supervised to ensure reliability, available with single or double-button activation and include a 3V lithium battery.

Why Inovonics Wireless is Best

The Inovonics Commercial Mesh Network has been specifically developed for commercial applications to provide the most cost-effective solution for a wide range of applications, while setting new standards for performance and reliability in a wireless sensor network.

Reliability

Inovonics EchoStream 900MHz radio utilizes a unique frequency hopping, spread spectrum technology to meet the demands of an increasingly cluttered wireless world.

Flexibility

The flexibility of wireless is a necessity in today's dynamic commercial environments. The self-configuring EchoStream Commercial Mesh Network allows you to adapt to changing floor plans and requirements in a matter of minutes. New sensors can be added to the network as fast as they can be mounted.

Scalability

The EchoStream Commercial Mesh Network's backbone of intelligent repeaters can extend coverage to thousands of sensors across entire commercial campuses.
EN1223S - Single button, water resistant pendant transmitter

This single button, water resistant pendant is our smallest, lightest, and most versatile pendant. Weighing less than 1.4oz, it comes with a neck cord and belt clip and can be easily converted by the end user. With the single-button, one-second press and hold activation, and a compact design, it is ideal for assisted living installations. Like all Inovonics pendants, the EN1223S features a fully supervised radio link to help ensure reliability. Wristband also available.

EN1233S - Single button pendant transmitter

This pendant has a sleek design with simple, single button activation. LED flashes with all transmissions, including supervision, so the user is reassured the unit is operating. Pendant should be supervised. It comes with neck cord or it can be easily mounted for fixed position signaling.

EN1233D - Double button pendant transmitter

Same as the EN1233S but includes two buttons to minimize accidental activation. Both buttons must be pressed simultaneously to initiate an alarm transmission.

EN1235SF - Single button, fixed position pendant transmitter

Same as the EN1235S, but comes as a fixed-position hold up transmitter with back tamper. LED flashes on all transmissions, including supervision, so the user is reassured the unit is operating.

EN1235D - Double button, water resistant pendant transmitter

The EN1235D is similar to the EN1223S but designed to meet the protection needs of patrolling guards, bank employees, and retail store employees. The two-button design provides protection against accidental activation. Both buttons must be pressed simultaneously to initiate an alarm transmission. The dimmed LED minimizes observation of alarm activation during duress situations. It has the same optional accessories as the EN1223S. Wristband also available.

EN1235S - Single button, belt clip pendant transmitter

This pendant has a smart design with simple, single button activation. LED flashes on all transmissions, including supervision, so the user is reassured the unit is operating. Comes with belt clip that can be converted to a belt loop. It can also be easily mounted for fixed-position signaling.

EN1235DF - Double button, fixed position pendant transmitter

Same as the EN1235D, but comes as a fixed-position hold up transmitter with back tamper. LED flashes on all transmissions, including supervision, so the user is reassured the unit is operating.

### Why Supervise Pendants?

Most installers prefer to install wireless transmitters that offer automatic supervision of the radio link. However, many believe that pendants cannot be supervised because they are taken offsite. Inovonics strongly believes that all wireless transmitters, including pendants, should be supervised. Supervision safeguards against undetected loss of service due to end user damage such as dropping the pendant repeatedly, exposing it to extreme temperatures, getting it wet, or other similar events. Supervising pendants need not cause unnecessary reports to the central station. There are several ways to provide security to your customers and possibly reduce your liability by customizing supervision to meet application criteria.

### Specifications

<table>
<thead>
<tr>
<th>Model</th>
<th>Frequency</th>
<th>Dimensions</th>
<th>Battery</th>
<th>Battery life</th>
</tr>
</thead>
<tbody>
<tr>
<td>EN1223S</td>
<td>900MHz</td>
<td>2.2x1.9x0.72”</td>
<td>BAT609</td>
<td>1-2 years</td>
</tr>
<tr>
<td>EN1223D</td>
<td>900MHz</td>
<td>2.2x1.9x0.72”</td>
<td>BAT609</td>
<td>1-2 years</td>
</tr>
<tr>
<td>EN1233S</td>
<td>900MHz</td>
<td>3.0x1.6x0.72”</td>
<td>BAT608</td>
<td>3-5 years</td>
</tr>
<tr>
<td>EN1233D</td>
<td>900MHz</td>
<td>3.0x1.6x0.72”</td>
<td>BAT608</td>
<td>3-5 years</td>
</tr>
<tr>
<td>EN1235S</td>
<td>900MHz</td>
<td>3.0x1.6x1.0”</td>
<td>BAT608</td>
<td>3-5 years</td>
</tr>
<tr>
<td>EN1235D</td>
<td>900MHz</td>
<td>3.0x1.6x1.0”</td>
<td>BAT608</td>
<td>3-5 years</td>
</tr>
<tr>
<td>EN1235SF</td>
<td>900MHz</td>
<td>3.0x1.6x0.72”</td>
<td>BAT608</td>
<td>3-5 years</td>
</tr>
<tr>
<td>EN1235DF</td>
<td>900MHz</td>
<td>3.0x1.6x0.72”</td>
<td>BAT608</td>
<td>3-5 years</td>
</tr>
</tbody>
</table>

### Pendant transmitter accessories

<table>
<thead>
<tr>
<th>Part #</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACC603L</td>
<td>Simulated leather neck cord</td>
</tr>
<tr>
<td>ACC603M</td>
<td>Metal neck cord</td>
</tr>
<tr>
<td>ACC603P</td>
<td>Plastic neck cord</td>
</tr>
<tr>
<td>ACC605-BK</td>
<td>Pendant belt clip replacement</td>
</tr>
<tr>
<td>ACC621</td>
<td>EN1223D/S housing screw</td>
</tr>
<tr>
<td>ACC623A</td>
<td>EN1223D/S accessory pack</td>
</tr>
<tr>
<td>ACC623L/S</td>
<td>EN1223D/S wrist strap</td>
</tr>
<tr>
<td>ACC623L/S BULK</td>
<td>50 EN1223D/S wrist straps</td>
</tr>
</tbody>
</table>

---

- Operating Environment: 32° to 140°F, up to 90% relative humidity (non-condensing)
- Unless otherwise noted, typical battery life shown is for supervised operation
- Not all brands are equivalent. Please use only Sanyo or Panasonic CR2 or approved equivalent.
- The range and performance of any wireless product depends on the structure and environment in which it operates.
- Continual enhancements to our products may cause specifications to change without notice.
The Inovonics four zone add-on receiver with relay outputs programs and supervises up to four Inovonics transmitters. This receiver includes Form C relays for each output, allowing connection to any hardwire panel or stand-alone wireless application.

**Product Features**

- LEDs allow the user to view the current status of all four transmitters
- Outputs can be configured in follower, latching, momentary, or toggle modes independently
- Case tamper protection, jam detection and internal antennas for a secure wireless implementation

**Product Specifications**

- **Weight:** 9.9 oz (280 g)
- **Power requirement:** 11 - 14 VDC; 400 mA
- **Output specifications:** Form C relay 1A @ 28 VDC, 0.5A @ 30 VAC resistive load; N/O receiver case tamper contact closure, N/C receiver jam output indication
- **Input specifications:** A low is less than .5 V; a high is greater than 2.5 V
- **Reset input:** Contact closure, momentary low
- **Number of points/transmitters:** Four
- **Number of alarm outputs:** Four Form C relay outputs
- **Number of fault outputs:** One Form C relay output
- **Operating environment:**
  - **Temperature:** 32° - 140°F
  - **Humidity:** Up to 90% (non-condensing)
- **Market:** North America, Australia, New Zealand
- **EchoStream® frequency:** 902-928 MHz, frequency hopping spread spectrum
- **Regulatory compliance:** FCC, Industry Canada, RoHS, AS/NZS 4268:2008, UL 365, UL 636, UL 985, UL 1023, ULC/ORD-C1023-74, UL 1610, UL 1076
**Inputs**

- VS
- Ground
- NC
- COM 1
  - NO
- NC
- COM 2
  - NO
- NC
- COM 3
  - NO
- NC
- COM 4
  - NO
  - NC
  - FAULT
  - NO

**Dimensions**

- Depth: 1.025"
- Width: 6.5"
- Height: 3.6"
- D: .156"
- 4.896"

---


- EN4204R Four Zone Add-On Receiver with Relay Outputs Installation Instructions
- EchoStream Developer Guide
- Inovonics Product Catalog: North America

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**Technical documents**

For technical documents visit us at http://www.inovonics.com/support/tech-documents/ or use the QR code below.

---

- The range and performance of any wireless product depends on the structure and environment in which it operates.
- Continual enhancements to our products may cause specifications to change without notice.
- Patents: 7,154,866; 7,554,932; 7,746,804; others pending.
Instructions

909 Surface Mount
1. Remove decorative bezel around switch.
2. Mount switchbase in desired location.
3. Connect wires under appropriate terminals (Fig. 1).
4. Replace decorative bezel.

909 Flush Mount *
1. Remove decorative bezel around switch.
2. Cut a 2-1/4” x 1-1/4” hole in the drywall.
3. Connect wires under appropriate terminals (Fig. 2).
4. Insert switch into hole. Tighten the two metal slot screws, until switch is secure.
5. Replace decorative bezel.

---

**NOTE**: Specifications are subject to change without notice. N/C – Normally Closed; N/O – Normally Open; C - Common

*Maintained not available for Flush Mount.

---

<table>
<thead>
<tr>
<th>Description</th>
<th>Switch Mode</th>
<th>Switch Configuration</th>
<th>Switch Rating</th>
<th>Standard Finish</th>
</tr>
</thead>
<tbody>
<tr>
<td>909-MO Rocker Switch</td>
<td>Momentary Action</td>
<td>SPDT N/O or N/C</td>
<td>10A @250V</td>
<td>Beige (plastic)</td>
</tr>
<tr>
<td>909-MA Rocker Switch</td>
<td>Maintained Action*</td>
<td>SPDT N/O or N/C</td>
<td>10A @250V</td>
<td>Beige (plastic)</td>
</tr>
</tbody>
</table>
AXIS T94R01B Corner Bracket
For outdoor and indoor installations

The powder-coated aluminum AXIS T94R01B Corner Bracket is used for attaching the wall mount of Axis’ camera housing to the outer corners of a building. AXIS T94R01B Corner Bracket is also compatible with AXIS T91E61 Wall Mount for fixed dome cameras. Small-size fixed dome and bullet-style cameras can be mounted as well thanks to the included and commonly used hole pattern of a single gang junction box.

> For outdoors and indoors – corners
> Flexibility – covers many different camera types
> Resistant to corrosion
> Sturdy and safe
## AXIS T94R01B Corner Bracket

### General

<table>
<thead>
<tr>
<th>Supported products</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>AXIS P32 Series, AXIS T91E61 Wall Mount, AXI</td>
<td></td>
<td></td>
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<tr>
<td></td>
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</tr>
<tr>
<td></td>
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</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Casing</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>NEMA 4X- and IK10-rated impact resistant aluminum mount</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Color: White NCS S 1002-B</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Environment</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Indoor</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Outdoor</td>
<td></td>
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<table>
<thead>
<tr>
<th>Cable routing</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Back: Cable hole</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Maximum load</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>8 kg (17.64 lb)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Approvals</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>IEC/EN/UL 60950-1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>IEC/EN/UL 60950-22</td>
<td></td>
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</tr>
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</table>

<table>
<thead>
<tr>
<th>Vibration</th>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>Class 4M3 IEC 60068-2-6 and IEC 60068-2-27</td>
<td></td>
<td></td>
</tr>
<tr>
<td>EN 50581, REACH, CE</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Dimensions</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>171.7 x 120 x 102 mm (7 x 5 x 4 in)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Weight</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>0.35 kg (0.8 lb)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Included accessories</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Installation Guide</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Optional accessories</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>For more accessories, see <a href="http://www.axis.com">www.axis.com</a></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Warranty</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Axis 3-year warranty, see <a href="http://www.axis.com/warranty">www.axis.com/warranty</a></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Environmental responsibility:
www.axis.com/environmental-responsibility

©2016 - 2018 Axis Communications AB. AXIS COMMUNICATIONS, AXIS, and VAPIX are registered trademarks or trademark applications of Axis AB in various jurisdictions. All other company names and products are trademarks or registered trademarks of their respective companies. We reserve the right to introduce modifications without notice.
**AXIS Q3515-LV Network Camera**
Fixed dome for solid performance in HDTV 1080p

AXIS Q3515-LV is a vandal-resistant fixed dome for demanding locations. Thanks to its top-quality image sensor, along with Forensic WDR, Lightfinder technology and OptimizedIR illumination, the camera provides unparalleled video quality in any light conditions. Electronic image stabilization is instrumental for smooth and steady video when subject to vibrations. The camera offers redundancy between Power over Ethernet and DC power. Video analytics, supervised inputs and digital outputs further support the surveillance assignment.

> **HDTV 1080p video in full frame rate with Forensic WDR**
> **Lightfinder and OptimizedIR**
> **Axis Zipstream technology**
> **EIS, IK10 vandal resistance, IP52 water and dust protection**
> **Power with redundancy and configurable I/O ports**
**AXIS Q3515-LV Network Camera**

| Models  | AXIS Q3515-LV 9 mm  
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Camera</td>
<td>AXIS Q3515-LV 22 mm</td>
</tr>
</tbody>
</table>

**Image sensor**
Progressive scan RGB CMOS 1/2.8".

**Lens**
Varifocal. Remote focus and zoom, P-Iris control, IR corrected
9 mm: 3–9 mm, F.1.3
Horizontal field of view: 105°–36°
Vertical field of view: 57°–21°
9 mm: 9–22 mm, F.1.6
Horizontal field of view: 36°–15°
Vertical field of view: 19°–9°

**Day and night**
Automatically removable infrared-cut filter

**Minimum illumination**
9 mm: HDTV 1080p 25/30 fps with Forensic WDR and Lightfinder:
Color: 0.07 lx at 50 IRE, F.1.3; B/W: 0.01 lx at 50 IRE, F.1.3
HD TV 1080p 50/60 fps with Forensic WDR and Lightfinder:
Color: 0.14 lx at 50 IRE, F.1; B/W: 0.03 lx at 50 IRE, F.1.3
HD TV 1080p 100/120 fps:
Color: 0.28 lx at 50 IRE, F.1.3; B/W: 0.06 lx at 50 IRE, F.1.3
22 mm: HD TV 1080p 25/30 fps with Forensic WDR and Lightfinder:
Color: 0.11 lx at 50 IRE, F.1.6; B/W: 0.02 lx at 50 IRE, F.1.6
HD TV 1080p 50/60 fps with Forensic WDR:
Color: 0.12 lx at 50 IRE, F.1.6; B/W: 0.04 lx at 50 IRE, F.1.6
HD TV 1080p 100/120 fps:
Color: 0.44 lx at 50 IRE, F.1.6; B/W: 0.08 lx at 50 IRE, F.1.6

**Shutter time**
1/66500 to 2 s

**Camera angle adjustment**
Pan: ±360°
Tilt: ±80°
Rotation: ±175°

**Video**

<table>
<thead>
<tr>
<th>Video compression</th>
<th>H.264 (MPEG-4 Part 10(AVC) Baseline, Main and High Profiles</th>
<th>Motion JPEG</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resolution</td>
<td>1920x1080 to 160x80</td>
<td></td>
</tr>
</tbody>
</table>

**Frame rate**
HD TV 1080p (1920x1080) with WDR:
Up to 50/60 fps with power line frequency 50/60 Hz
HD TV 1080p (1920x1080) without WDR:
Up to 100/120 fps with power line frequency 50/60 Hz

**Video streaming**
Multiple, individually configurable streams in H.264 and Motion JPEG
Axis Zipstream technology in H.264
Controllable frame rate and bandwidth
VBR/MVR H.264

**Multi-view streaming**
8 individually cropped-out view areas

**Pan/Tilt/Zoom**
Digital PTZ, Optical zoom, Preset positions
9 mm: 3x Optical zoom, 2x Digital zoom
22 mm: 2.4x Optical zoom, 2x Digital zoom

**Image settings**
Scene profiles, compression, color, brightness, sharpness, contrast, local contrast, white balance, day/night threshold, exposure control (including automatic gain control), defogging, exposure zones, fine tuning of behavior at different light levels, Forensic WDR:
Up to 120 dB depending on scene, electronic image stabilization, barrel distortion correction, dynamic text and image overlay, privacy masks, mirroring of images, straighten image, rotation: 0°, 90°, 180°, 270°, auto, including corridor format

**Audio**

<table>
<thead>
<tr>
<th>Audio streaming</th>
<th>Full-duplex</th>
</tr>
</thead>
<tbody>
<tr>
<td>Audio compression</td>
<td>24-bit LPCM 48 kHz, AAC LC 8/16/32/48 kHz, G.711 PCM 8 kHz, G.726 ADPCM 8kHz, Opus 8/16/48 kHz</td>
</tr>
</tbody>
</table>

**Audio input/output**
Input for external microphone or line-level device
Line output
Support for AXIS Dome Microphone A to be mounted inside the casing.

**Network**

| Security        | Password protection, IP address filtering, IEEE 802.1X network access control, HTTPS encryption, digest authentication, user access log, centralized certificate management, brute force delay protection, signed firmware |

**Supported protocols**
IP, IPv4, IPv6, UDP, HTTP, HTTPS, SSL/TLS, QoS Layer 3 DiffServ, FTP, SFTP, CSF/SMB, SMTP, Bonjour, UPnP, SNMP v1/v2c/v3 (MIB-II), DNS, DynDNS, NTP, RTSP, RTP, SFTP, TCP, UDP, IGMP, RTP/PC, ICMP, DHCP, ARP, SOCKS, SSH, LLDP

**System integration**

| Application Programming Interface | Open API for software integration, including VAPIX® and AXIS Camera Application Platform; specifications at axis.com |

**Analytics**
Included
AXIS Video Motion Detection, AXIS Motion Guard, AXIS Fence Guard, AXIS Loitering Guard, active tampering alarm, audio detection

**Supported**
AXIS Perimeter Defender, AXIS Digital Autotracking
Support for AXIS Camera Application Platform enabling installation of third-party applications, see axis.com/acap

**Event triggers**
Analytics, supervised external inputs, virtual inputs through API, edge storage events, shock detection

**Event actions**
Record video: SD card and network share
Upload of images or video clips: FTP, SFTP, HTTP, HTTPS, network share and email
Pre-and post-alarm video or image buffering for recording or upload
Notification: email, HTTP, HTTPS, TCP and SMTP trap
Overlay text, external output activation, play audio clip, zoom preset

**Data streaming**
Event data

**Built-in installation aids**
Remote zoom, remote focus, pixel counter, leveling assistant, autorotation, straighten image, traffic wizard

**General**

<table>
<thead>
<tr>
<th>Casing</th>
<th>IP52-rated, IK10 impact-resistant casing with polycarbonate hard-coated dome, aluminium base and dehumidifying membrane</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Encapsulated electronics, captive screws</td>
</tr>
<tr>
<td>Color</td>
<td>White NCS S 1002-B</td>
</tr>
<tr>
<td></td>
<td>For repainting instructions of casing or skin cover and impact on warranty, contact your Axis partner.</td>
</tr>
</tbody>
</table>

**Mounting**
Mounting bracket with holes for junction boxes (double-gang, single-gang, 4", square, and 4" octagon) and for ceiling and wall mounting
½" (M20) conduit side entry

**Sustainability**
PVC-free

**Memory**
1 GB RAM, 512 MB Flash

**Power**
Power over Ethernet (PoE) IEEE 802.3af/802.3at Type 1 Class 3, typical 5.6 W, max 12.5 W
8–28 V DC, typical 6.3 W, max 13.6 W
Power redundancy

**Connectors**
RJ45 10BASE-T/100BASE-TX PoE, terminal block for two configurable supervised inputs / digital outputs (12 V DC output, max load 50 mA), 3.5 mm mic/line in, 3.5 mm line out, terminal block for DC input

**IR illumination**
Optimized IR with power-efficient, long-life 850 nm IR LEDs
9 mm: Range of reach 40 m (130 ft) or more depending on the scene
22 mm: Range of reach 60 m (200 ft) or more depending on the scene

**Storage**
Support for microSD/microSDHC/microSDXC card
Support for SD card encryption
Support for recording to network-attached storage (NAS)
For SD card and NAS recommendations see axis.com

**Operating conditions**
-10°C to 50°C (-14°F to 122°F)
Humidity 10–85% RH (non-condensing)

**Storage conditions**
-40°C to 65°C (-40°F to 149°F)
Humidity 5–95% RH (non-condensing)

**Approvals**
EMC EN 55032 Class A, EN 55024, IEC/EN 61000-6-1, IEC/EN 61000-6-2, FCC Part 15, Subpart B, Class A,
<table>
<thead>
<tr>
<th>Dimensions</th>
<th>Weight</th>
<th>Included accessories</th>
</tr>
</thead>
<tbody>
<tr>
<td>Height: 124 mm</td>
<td>1.4 kg</td>
<td>Installation Guide, Windows decoder 1-user license, drill hole template, cable gaskets, I/O and DC connectors, connector guard, Resistor® T20 L-key, mounting bracket</td>
</tr>
<tr>
<td>Ø 162 mm</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Optional accessories</th>
</tr>
</thead>
<tbody>
<tr>
<td>AXIS Q35 Smoked Dome A, AXIS Dome Intrusion Switch B, AXIS Multicable B I/O Audio Power</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Video management software</th>
<th>AXIOMax Companion, AXIS Camera Station, video management software from Axis’ Application Development Partners available at axis.com/visualisation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Languages</td>
<td>English, German, French, Spanish, Italian, Russian, Simplified Chinese, Japanese, Korean, Portuguese, Traditional Chinese</td>
</tr>
<tr>
<td>Warranty</td>
<td>Axis 3-year warranty and AXIS Extended Warranty option, see axis.com/warranty.</td>
</tr>
</tbody>
</table>

a. This product includes software developed by the OpenSSL Project for use in the OpenSSL Toolkit (www.openssl.org), and cryptographic software written by Eric Young (eay@cryptsoft.com).

Environmental responsibility: axis.com/environmental-responsibility
AXIS Q3517-LVE Network Camera
Outdoor-ready fixed dome for solid performance in 5 MP

AXIS Q3517-LVE is a vandal-resistant fixed dome for harsh environments with a weathershield protecting against snow, rain and reflections. Thanks to its top-quality image sensor, along with Forensic WDR, Lightfinder technology and OptimizedIR illumination, the camera provides unparalleled video quality in any light conditions. Electronic image stabilization is instrumental for smooth and steady video when subject to vibrations. The camera offers redundancy between Power over Ethernet and DC power. Video analytics, supervised inputs and digital outputs further support the surveillance assignment.

> 5 MP resolution at full framerate
> Forensic WDR, Lightfinder and OptimizedIR
> Axis Zipstream technology
> EIS and vandal resistance with IK10+ rating
> Power with redundancy and configurable I/O ports
# AXIS Q3517-LVE Network Camera

<table>
<thead>
<tr>
<th>Camera</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Image sensor</td>
<td>Progressive scan RGB CMOS 1/1.8&quot;</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Lens</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Vari-focal, 4.3-8.6 mm, F1.5</td>
<td></td>
</tr>
<tr>
<td>Horizontal field of view: 96° – 50°</td>
<td></td>
</tr>
<tr>
<td>Vertical field of view: 53° – 29°</td>
<td></td>
</tr>
<tr>
<td>Remote focus and zoom, P-Iris control, IR-corrected</td>
<td></td>
</tr>
</tbody>
</table>

| Day and night | Automatically removable infrared filter |

<table>
<thead>
<tr>
<th>Minimum illumination</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>5MP: 25/30 fps with WDR and Lightfinder</td>
<td></td>
</tr>
<tr>
<td>4MP: 50/60 fps with WDR and Lightfinder</td>
<td></td>
</tr>
</tbody>
</table>

| Shutter time | 1/71 500 s to 2 s |

| Camera angle adjustment | Pan: ±360°, Tilt: ±90°, Rotation: ±175° |

<table>
<thead>
<tr>
<th>Video</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Video compression</td>
<td>H.264 (MPEG-4 Part 10/AVC) Baseline, Main and High Profiles, Motion JPEG</td>
</tr>
<tr>
<td>Resolution</td>
<td>3072x1728 to 160x120</td>
</tr>
<tr>
<td>Frame rate</td>
<td>5MP: WDR; 25/30 fps with power line frequency 50/60 Hz, 4MP: WDR: 50/60 fps with power line frequency 50/60 Hz</td>
</tr>
<tr>
<td>Video streaming</td>
<td>Multiple, individually configurable streams in H.264 and Motion JPEG, Axis Zipstream technology in H.264, Controllable frame rate and bandwidth VBR/MBR H.264</td>
</tr>
<tr>
<td>Multi-view streaming</td>
<td>8 individually cropped-out view areas</td>
</tr>
<tr>
<td>Pan/Tilt/Zoom</td>
<td>Digital PTZ, Optical zoom, Preset positions</td>
</tr>
<tr>
<td>Image settings</td>
<td>Scene profiles, compression, color, brightness, sharpness, contrast, local contrast, white balance, day/night threshold, exposure control (including automatic gain control), defogging, exposure zones, fine tuning of behavior at different light levels, Forensic WDR: Up to 120 dB depending on scene, electronic image stabilization, barrel distortion correction, dynamic text and image overlay, privacy masks, mirroring of images, straighten image, rotation: 0°, 90°, 180°, 270°, auto, including corridor format</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Audio</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Audio streaming</td>
<td>Full-duplex</td>
</tr>
<tr>
<td>Audio compression</td>
<td>24-bit LPCM 48 kHz, AAC LC 8/16/32/48 kHz, G.711 PCM 8 kHz, G.722 ADPCM 8kHz, Opus 8/16/48 kHz Configurable bitrate</td>
</tr>
<tr>
<td>Audio input/output</td>
<td>Input for external microphone or line-level device, Line output</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Network</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Security</td>
<td>Password protection, IP address filtering, IEEE 802.1X network access control*, HTTPS encryption, digest authentication, user access log, centralized certificate management, brute force delay protection, signed firmware</td>
</tr>
<tr>
<td>Supported protocols</td>
<td>IPv4, IPv6 USGv6, HTTP, HTTPS, SSL/TLS*, QoS Layer 3 DiffServ, FTP, SFTP, CIFS/SMB, SMTP, Bonjour, UPnP*, SNMP v1/v2c/v3 [MIB-II], DNS, DynDNS, NTP, RTSP, RTF, SFTP, TCP, UDP, IGMP, RTCP, ICMP, DHCP, ARP, SOCKS, SSH, LLDP</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>System integration</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Application Programming Interface</td>
<td>Open API for software integration, including VAPIX® and AXIS Camera Application Platform; specifications at axis.com</td>
</tr>
<tr>
<td>Analytics</td>
<td>Included AXIS Video Motion Detection, AXIS Motion Guard, AXIS Fence Guard, AXIS Loitering Guard, active tampering alarm, audio detection</td>
</tr>
</tbody>
</table>

* Support for power to device depends on region. ** IP66/67, IP69K, IK10, IK10-Rated, NEMA 4X-rated, 10/100BASE-TX, 10/100/1000BASE-TX, 10/100/1000 Gigabit, IEEE 802.3af/IEEE 802.3at Type 1 class 3, 802.3at, 30 W, max 12.9 W |

** Specifications and test conditions: **

- **Casing:** IP66, IP69K, IK10, NEMA 4X, IK010+ (50 joules) impact-resistant casing with polycarbonate hard-coated dome, aluminum base and dehumidifying membrane<br>
  - Encapsulated electronics, captive screws<br>
  - Color: White NCS S 1002-B

- **Mounting:** Mounting bracket with holes for junction boxes (double-gang, single-gang, 4" square, and 4" octagon) and for ceiling and wall mounting
  - 1/4" (M20) conduit side entry

- **Sustainability:** PVF-free, Energy Star, ETL Listed, E-Mark, CE, FCC

- **Memory:** 1 GB RAM, 512 MB Flash

- **Power:** Power over Ethernet (PoE) IEEE 802.3af/IEEE 802.3at Type 1 Class 3, typical 6.5 W, max 12.9 W (IEEE 802.3at Power over Ethernet, 10/100/1000BASE-TX Power over Ethernet, 10/100/1000 Gigabit Power over Ethernet), 8–28 V DC, typical 6.9 W, max 14.5 W (IEEE 802.3af Power over Ethernet, 10/100/1000BASE-TX Power over Ethernet, 10/100/1000 Gigabit Power over Ethernet)

- **Connectors:** RJ45 10BASE-T/100BASE-TX PoE, terminal block for two configurable supervised inputs / digital outputs (12 V DC output), max load 20 mA, 3.5 mm mic/line in, 3.5 mm line out, terminal block for DC input

- **IR illumination:** Optimized IR with power-efficient, long-life 850 nm IR LEDs, Range 40 m (130 ft) or more, depending on scene

- **Storage:** Support for microSD/microSDHC/microSDXC card, Support for SD card encryption, Support for recording to network-attached storage (NAS) for SD card and NAS recommendations see axis.com

- **Operating conditions:** 50 °C to 65 °C (-58 °F to 149 °F), Start-up: -40 °C to 60 °C (-40 °F to 140 °F), Humidity 10–100% RH (condensing)

- **Storage conditions:** -40 °C to 65 °C (-40 °F to 149 °F), Humidity 5–95% RH (non-condensing)


- **Dimensions:** Height: 182 mm including weathershield ø 183 mm

- **Weight:** 2.0 kg (4.4 lb) including weathershield
<table>
<thead>
<tr>
<th>Included accessories</th>
<th>Installation Guide, Windows decoder 1-user license, drill hole template, cable gaskets, I/O and DC connectors, connector guard, weathershield, Axis U-shape conduit adapter, Resistorx® T20 L-key, mounting bracket</th>
</tr>
</thead>
<tbody>
<tr>
<td>Optional accessories</td>
<td>AXIS Q35 Smoked Dome A, AXIS Dome Intrusion Switch B, AXIS Multicable B I/O Audio Power, AXIS Q35-VE Skin Cover A Black, AXIS ACI Conduit Adapter 3/4” NPS, AXIS T94M01D Pendant Kit including weathershield, AXIS T94M02L Recessed Mount, AXIS T8351 Microphone, Axis Mounts &amp; Cabinets For more accessories, see axis.com</td>
</tr>
<tr>
<td>Video management software</td>
<td>AXIS Companion, AXIS Camera Station, video management software from Axis' Application Development Partners available at axis.com/vms</td>
</tr>
</tbody>
</table>

Languages | English, German, French, Spanish, Italian, Russian, Simplified Chinese, Japanese, Korean, Portuguese, Traditional Chinese |

Warranty | Axis 3-year warranty and AXIS Extended Warranty option, see axis.com/warranty |

Environmental responsibility: axis.com/environmental-responsibility
AXIS T91E61 Wall Mount
Made for fixed dome cameras

AXIS T91E61 Wall Mount is specially designed for Axis fixed dome network cameras. Neat design for both indoor and outdoor installations.

Thanks to its impact-resistant and outdoor proven material, AXIS T91E61 Wall Mount suits all environments where Axis fixed dome cameras are used. It is designed for being mounted with Axis cameras and gives a discreet look due to its small form factor.

It is compatible with all Axis fixed dome pendant kits with a 1.5” NPS thread and can also be installed on AXIS T94R01P Conduit Back Box to enable use of cable protection conduits. With accessories it is possible to use the mount on poles, corners and on the door of AXIS T98A-VE Cabinet Series.

AXIS T91E61 has the same hole pattern as the wall mount for outdoor fixed box Axis cameras to enable an easy switch. The compatible conduit back box has the same hole pattern as AXIS T91A/T91B and AXIS T91D61 Wall Mounts, making sure that swapping two Axis cameras is as easy as possible.

Moreover, it is possible to run the cable externally by using one of the four cut-outs in the base of the wall mount.
## Technical Specifications - AXIS T91E61 Wall Mount

### Models
- **AXIS T91E61 Wall Mount**

### General

<table>
<thead>
<tr>
<th>Supported products</th>
<th>AX7S T94B01D Pendant Kit (AXIS M3004-V/M3005-V), AX7S T94F01D Pendant Kit (AXIS M3006-V/M3007-P/M3007-PV), AX7S T94F02D Pendant Kit (AXIS M3024-LVE/M3025-VE/M3026-VE/M3027-PVE), AX7S T94K01D Pendant Kit (indoor models of AX7S P32/P33/Q35), AX7S T94M01D Pendant Kit (outdoor models of AX7S Q35), AX7S T94T01D Pendant Kit (outdoor models of AX7S P32)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Casing</strong></td>
<td>Powder coated, chromated aluminum</td>
</tr>
<tr>
<td><strong>Color</strong></td>
<td>White NCS S 1002-B</td>
</tr>
<tr>
<td><strong>Interface</strong></td>
<td>1.5&quot; NPS</td>
</tr>
<tr>
<td><strong>Compliance</strong></td>
<td>RoHS, REACH, CE</td>
</tr>
<tr>
<td><strong>Approvals</strong></td>
<td>IEC/EN/UL 60950-1, IEC/EN/UL 60950-22, EN 50581, UL 50E, IEC 62262 K10, IEC 60721-3-4 (Class 4M4), NEMA 250 Type 4X</td>
</tr>
<tr>
<td><strong>Dimensions</strong></td>
<td>80 x 161 x 120 mm (3.1 x 6.3 x 4.7 in)</td>
</tr>
<tr>
<td><strong>Weight</strong></td>
<td>525 g (1.15 lb)</td>
</tr>
<tr>
<td><strong>Included</strong></td>
<td>Installation Guide</td>
</tr>
<tr>
<td><strong>Optional</strong></td>
<td>AX7S T94R01P Conduit Back Box, AX7S T91A47 Pole Mount, VT Corner Mount WCWA, Network Cable Coupler IP66 (requires AX7S T94R01P Conduit Back Box)</td>
</tr>
<tr>
<td><strong>Warranty</strong></td>
<td>Axis 3-year warranty, see <a href="http://www.axis.com/warranty">www.axis.com/warranty</a></td>
</tr>
</tbody>
</table>

### More information is available at [www.axis.com](http://www.axis.com)
AXIS T94R01B Corner Bracket
For outdoor and indoor installations

The powder-coated aluminum AXIS T94R01B Corner Bracket is used for attaching the wall mount of Axis’ camera housing to the outer corners of a building. AXIS T94R01B Corner Bracket is also compatible with AXIS T91E61 Wall Mount for fixed dome cameras. Small-size fixed dome and bullet-style cameras can be mounted as well thanks to the included and commonly used hole pattern of a single gang junction box.

> For outdoors and indoors – corners
> Flexibility – covers many different camera types
> Resistant to corrosion
> Sturdy and safe
# AXIS T94R01B Corner Bracket

## General

<table>
<thead>
<tr>
<th>Supported products</th>
<th>AXIS P32 Series, AXIS T91E61 Wall Mount, AXIS T94Q01A Wall Mount, AXIS T94B01P Conduit Back Box, AXIS T92E Series, AXIS T93F Series, AXIS T93G01 Protective Housing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Casing</td>
<td>NEMA 4X- and IK10-rated impact resistant aluminum mount Color: White NCS S 1002-B</td>
</tr>
<tr>
<td>Environment</td>
<td>Indoor Outdoor</td>
</tr>
<tr>
<td>Cable routing</td>
<td>Back: Cable hole</td>
</tr>
<tr>
<td>Maximum load</td>
<td>8 kg (17.64 lb)</td>
</tr>
<tr>
<td>Approvals</td>
<td>IEC/EN/UL 60950-1 IEC/EN/UL 60950-22</td>
</tr>
<tr>
<td>Vibration</td>
<td>Class 4M3 IEC 60068-2-6 and IEC 60068-2-27 EN 50581, REACH, CE</td>
</tr>
<tr>
<td>Dimensions</td>
<td>171.7 x 120 x 102 mm (7 x 5 x 4 in)</td>
</tr>
<tr>
<td>Weight</td>
<td>0.35 kg (0.8 lb)</td>
</tr>
<tr>
<td>Included accessories</td>
<td>Installation Guide</td>
</tr>
<tr>
<td>Optional accessories</td>
<td>For more accessories, see <a href="http://www.axis.com">www.axis.com</a></td>
</tr>
<tr>
<td>Warranty</td>
<td>Axis 3-year warranty, see <a href="http://www.axis.com/warranty">www.axis.com/warranty</a></td>
</tr>
</tbody>
</table>

Environmental responsibility: www.axis.com/environmental-responsibility
Ocularis is the video management system for enterprise and corporate projects with an emphasis on tactical real-time operations and live visualization. From convenience stores to citywide deployments and everything in between, Ocularis can scale up to accommodate an infinite number of cameras to match your growing system needs.

Ocularis lets you record video from IP network cameras—as well as analog cameras—using encoders—and can enhanced by integrating advanced tools like smart motion detection, access control, biometrics, and behavior analytics.

The Ocularis platform is offered in three models—Professional, Enterprise and Ultimate—to meet the needs of organizations of all sizes and types.

Ocularis Enterprise provides centralized management of users, cameras and servers and features recording server failover, redundant management servers.

Ocularis Enterprise’s capabilities can be extended with the optional Ocularis VideoWall which allows for collaborative control of video walls at multiple command and control centers.

For the full list of features, see the Ocularis Architecture & Engineering (A&E) document, available by request.
FEATURES

EASILY CONNECT MANY SECURITY RELATED APPLICATIONS

The Event Interface (SEI) breaks new ground to connect Ocularis to third-party security products using a flexible, driver-based approach. All events from third-party applications such as access control, burglar alarm and many more can now be visualized within the Ocularis client, for example by displaying them in maps and floor plans or opening the relevant camera streams.

OPEN ARCHITECTURE FOR EASY INTEGRATIONS

With the newly available Analytics Interface (SAI), Ocularis now also provides an open and standardised interface for technology and solution partners to easily develop plugins to connect Ocularis with their product portfolios. By using the SAI, any edge or server-based license plate recognition solution on the market can now be easily integrated.

CENTRALIZED MANAGEMENT OF USERS, CAMERAS AND SERVERS

Ocularis Enterprise provides easy control and management of the entire system; user access and privileges, camera and server configurations, maps and alerts. Built-in support for Microsoft Active Directory™ authentication provides for simple and secure Single Sign-On (SSO) access to the system.

FAILOVER AND REDUNDANCY INCLUDED FOR MAXIMUM UPTIME

Ocularis Enterprise includes at no extra cost both recording server failover and redundant management server capabilities to keep your critical video system operational 24/7.

END-TO-END DATA SECURITY

Ocularis uses modern TLS 1.2 encryption protocols to secure camera-to-server communications, server-to-server communications and Client-to-server communications. Recorded video is protected by utilizing a randomized data structure containing no camera identification information.

NO PROPRIETARY HARDWARE REQUIREMENTS

Ocularis runs on non-proprietary, off-the-shelf PC hardware and is also supported in virtual environments such as Microsoft Hyper-V and VMware. Ocularis supports the leading manufacturers’ cameras and devices—including almost all embedded analytics and features—as well as the ONVIF and ONVIF Profile S standards allowing you to use the right camera technology for your application.

COMPOSITE EVENTS (‘EVENT FUSION’)

Composite Events are created by linking two events or alerts, configured by sequence order, time interval and logical conditioning (e.g. ‘If Door ‘A’ opens, but no motion detection on Camera ‘N’, within 15 seconds’). Composite Events can be fused with other events to create complex detection scenarios, and assigned priority for push video and handling by Ocularis Client operators.

OPEN-ARCHITECTURE NON-PROPRIETARY TECHNOLOGY

Ocularis runs on non-proprietary, off-the-shelf PC hardware and supports leading manufacturers’ cameras and devices. Support is built-in for all industry-standard compression formats (MPEG-4, MJPEG, H.264, H.265 and MxPEG) and the ONVIF and ONVIF Profile S standards. Ocularis Base and Ocularis Recorders are also fully supported in virtual environments such as VMware and Microsoft Hyper-V.

AUTOMATIC RECORDER PATCH UPDATES

Recorder patch updates are automatically downloaded and applied in Ocularis 5, keeping the system up-to-date and secure. Administrators may also choose to download and install patches manually. This is the most effective way to make sure all of your servers are updated 100% of the time.

DYNAMIC DATA MANAGEMENT

Ocularis Professional features efficient and dynamic data management with automatic load balancing across multiple storage volumes with no archiving requirements.
FEATURES

VIDEO BACKUP
Automatically create a copy of your video data in another location - either on-site or off-site - to protect your important recordings. Video Backup can also be used with mobile NVRs in transportation applications to offload video from a bus, train, delivery van or patrol car to a central location for review.

FLEXIBLE RECORDING OPTIONS
Ocularis features both Standard (continuous) and Alarm Recording, based on motion detection or other alarm input. Each recording mode can be configured with different retention policies ensuring that all critical video data is captured and saved. Alarm Recording can also be configured to use a secondary stream for added recording flexibility and optimal utilization of storage.

SERVER-BASED DETECTORS
In addition to supporting camera-based motion detection and analytics, Ocularis 5 also includes efficient server-based motion detection with multiple regions of interest, each with their own sensitivity and threshold adjustments. Ocularis 5 also includes server-based tampering detection and reference image comparison to monitor the status of your cameras.

SYSTEM HEALTH MONITORING
Ocularis provides real-time and detailed information to system administrators including disk utilization, camera status, bandwidth utilization as well as email and SMS alerts upon errors and other issues.

SMART CAMERA DRIVERS
Smart Camera Drivers for Allnet, Arecont, Axis, Bosch, Convision, Canon, Dahua, Eclipse, FLIR, Grundig, Hikvision, Interlogix, Northern, Panasonic, Hanwha Techwin, Sony, THK Security, Vanderbilt, Vivotek and more support almost all embedded analytics and features allowing full use of the camera’s capabilities including the latest H.265 HEVC compression.

SUPPORT FOR THOUSANDS OF OTHER CAMERAS
Ocularis 5 also supports thousands of cameras from dozens of technology partners with model-specific drivers and also includes full support for ONVIF and ONVIF Profile S compatible cameras. Ocularis’s extensive camera support allows customers to choose the right camera for the application.

CRITICAL CAMERA FAILOVER
Ocularis features automatic switching of interrupted or disconnected video streams in any live view within 2-3 seconds—including maps and blank screen events—to designated alternate camera streams. This unique feature ensures operators never lose sight of the situation.

MULTI-STREAMING SUPPORT
Ocularis 5 takes advantage of multiple streams from cameras to minimize bandwidth usage to web, mobile and desktop Clients. With automatic stream selection, Ocularis Client displays the optimal stream for viewing. Multiple streams can also be used to optimize recording by using a lower resolution stream for Standard Recording and a full resolution stream for Alarm Recording.

CENTRAL MANAGEMENT FOR USERS, ALERTS VIEWS AND MAPS
Client operators are managed by the Ocularis Base, which coordinates all event and alert handling, manages users’ rights to specific cameras and functions system-wide (Active Directory supported), and distributes all shared assets.

USER AUDIT LOGGING
All user and administrator activity may be logged by enabling audit logging in Ocularis Base. A built-in query tool provides easy-to-read, color-coded results with export capability for further investigation and statistical reporting.
FEATURES

VIDEO FLAGGING

Operators can flag video for later reference, within the Ocularis Client if they see something of interest. Flags may also be created on recorded video.

INTUITIVE UNIFIED DESKTOP CLIENT

Ocularis Client offers a user-friendly operator interface with support for up to 8 displays with independent functionality and local video-wall capability. Ocularis Client requires only minimal training and free operator Client training is available online.

ADVANCED WEB AND MOBILE CLIENTS

Up to 16 cameras can be viewed live in both the Ocularis Web Client and Mobile apps. Playback, Alert Handling and AVI Export are also supported. Ocularis Mobile apps are available for Android and iOS devices free of charge and the Web Client supports multiple browsers across Mac and PC.

UNLIMITED SHARED AND PRIVATE VIEWS

On the desktop, Ocularis Client users can create and save an unlimited number of views of different sizes (up to 8 x 8 panes), consisting of camera streams, carousels, hotspots, web pages and Blank Screen panes for receiving automatic (on-event) and manual (peer-to-peer) push-video alerts.

LIVE MONITORING WITH INSTANTANEOUS INVESTIGATION

While monitoring live video feeds, users can perform basic investigation on individual cameras—playback, digital PTZ and optical PTZ (for PTZ cameras)—without the need to switch to a dedicated investigation mode.

360-DEGREE CAMERA DEWARPING

Ocularis Client features native dewarping of 360-degree cameras from ACTi, Axis, Bosch, OnCam Grandeye, Panasonic, Pelco, Samsung, Sentry 360, and Vivotek as well as for cameras equipped with the ImmerVision Panamorph lens.

EXCLUSIVE INVESTIGATIONTOOLS

Ocularis Client’s dynamic TimeSlicer™ can shorten investigation time to seconds instead of hours or even days by quickly showing thumbnails in different time steps or via built-in motion detection. The Kinetic Timeline™ provides fast access to continuous historical data with a backwards and forwards swipe navigation and color codes to help identify recorded video.

MULTI-LANGUAGE SUPPORT

Ocularis Client includes support for Arabic-Modern Standard, Chinese (simplified), Dutch, English, Finnish, French, German, Hebrew, Italian, Japanese, Korean, Portuguese, Russian, Spanish and Swedish.

SHARED EVENT HANDLING

All events generated within the Ocularis system—or integrated 3rd-party systems—can be handled from any Client with real-time alerting via pop-up video in the desktop Client, notifications on the Mobile Clients or pop-up alerts on the Web Client. Alerts can also be displayed on maps and shared with 3rd-party systems.

CAPTURE VIDEO ON-THE-SPOT

With M2O™ (Mobile-to-Ocularis), mobile devices can be used to stream video into Ocularis®, just like another IP camera.

*Requires a camera license.
RecOn5 Servers and NVRs have been certified to work with Ocularis. For more information visit our website.

SYSTEM COMPONENTS

**OCULARIS CLIENT**
Unified operator interface for live monitoring, playback and investigation, alert management, map navigation and local VideoWall control for workstation connected displays.

**OCULARIS BASE**
Manages the flow of event, user and system status data from the various system components. Provides Active Directory authentication for Client operators.

**OCULARIS RECORDER**
The Ocularis Recorder is built upon the foundation of the Core management service and one or more servers running the Device Manager service. These may be installed together or on separate servers. System configuration, alarm processing and video data storage are handled by the Ocularis Recorder components.

**OCULARIS MEDIA SERVER**
Enables web and mobile access to video and alerts and also serves as the gateway for M2O™ video from mobile devices.
### FEATURE SET COMPARISON

<table>
<thead>
<tr>
<th>Ocularis System Feature</th>
<th>Professional</th>
<th>Enterprise</th>
<th>Ultimate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of cameras per system</td>
<td>Unlimited</td>
<td>Unlimited</td>
<td>Unlimited</td>
</tr>
<tr>
<td>Number of recorders per system</td>
<td>Unlimited</td>
<td>Unlimited</td>
<td>Unlimited</td>
</tr>
<tr>
<td>Number of concurrent client connections</td>
<td>Unlimited</td>
<td>Unlimited</td>
<td>Unlimited</td>
</tr>
<tr>
<td>Ocularis Mix &amp; Match - combining multiple recorder types in a single system</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Ocularis OpenSight™ option for sharing video between Ocularis systems</td>
<td>Remote</td>
<td>Remote</td>
<td>May/Remote</td>
</tr>
<tr>
<td>Critical Camera Failover for camera failure protection</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Centralized user management with color-coded audit logging of user activity</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Includes Active Directory support for secure system access</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Data Link and Network I/O event integration</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Event Fusion / Composite Events</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Ocularis Web and Mobile Clients included with optional M2O (Mobile-to-Ocularis) video streaming</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Event Actions including move-to-PTZ-preset, email, TCP/UDP and HTTP messaging</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Ocularis Client Features</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Number of cameras per server</td>
<td>128</td>
<td>Unlimited</td>
<td>Unlimited</td>
</tr>
<tr>
<td>Fully redundant recorder manager without using clustering</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Automatic recorder patch update service</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Automatic failover of recording servers</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Efficient and dynamic data load balancing with no archiving requirements</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Video data aging (grooming) for long term storage optimization</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Automatic mirroring of video data to failover recorder for complete redundancy</td>
<td>No</td>
<td>No</td>
<td>Optional</td>
</tr>
<tr>
<td>Automatic edge recording retrieval after network disconnect</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Automatic Video Backup of important data to another location</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Support for H.265, H.264, MPEG-4, MJPEG, and MxMPEG compression formats</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Support for camera-based analytics including Axis Dynamic Event Stream</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Server-based motion detection, tampering detection and reference image comparison</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Support for thousands of IP cameras plus ONVIF, ONVIF Profile S, generic RTPSP and MJPEG drivers</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Smart Camera Drivers for most major camera manufacturers (See our supported devices list on the web for complete details)</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Support for multi-streaming from cameras for efficient bandwidth utilization</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>TLS 1.2 and HTTPS (SSL) encryption for camera to recorder communication</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>License-free digital input/output device support (number of devices)</td>
<td>5 Unlimited</td>
<td>Unlimited</td>
<td>Unlimited</td>
</tr>
<tr>
<td>Simultaneous Standard and Alarm Recording with separate retention policies</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Incoming audio recording for supported cameras</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Two-way audio support for select cameras and audio-only devices</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Multicast live view from recorder to Ocularis Client</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
</tr>
</tbody>
</table>
SYSTEM REQUIREMENTS

SUPPORTED OPERATING SYSTEMS (ALL 64-BIT)

- Microsoft Windows® 7 SP1 (Professional, Ultimate, Enterprise)
- Microsoft Windows® 8.1 (Standard, Professional, Enterprise)
- Microsoft Windows 10 (Updates: Anniversary, Creators, Fall Creators) (Professional, Enterprise)
- Microsoft Windows Server® 2008 R2 SP1 (Standard, Enterprise)
- Microsoft Windows Server® 2012 (Standard, Datacenter)
- Microsoft Windows Server® 2012 R2 (Standard, Datacenter)
- Microsoft Windows Server® 2016 (Standard, Datacenter)
- Microsoft Windows Server® 2019 (Standard, Datacenter)

HARDWARE RECOMMENDATIONS

All Ocularis components may be installed on the same PC/server

OCULARIS BASE*

- CPU: Intel Core i3 or better
- RAM: 8 GB
- Hard Drive: Minimum 250 GB
- Software: Microsoft .NET 4.6.2 Framework; IIS 6.0 or newer

OCULARIS RECORDER*

Recommended:

- CPU: Intel Core i7-4930K @ 3.40GHz or Intel Xeon E5-2640 v3 @ 2.60GHz
- RAM: 16 GB
- HDD: 500 GB free disk space @ 7200 RPM for OS and Applications Additional storage as required for video storage
- Network: Ethernet with 1000 MBit/s. Do not team NIC’s except for fault tolerance (Bandwidth aggregation not supported)

Minimum:

- CPU: Intel Core i3 M 370 @ 2.40GHz
- RAM: 8 GB
- HDD: 100 GB free disk space for OS and Applications
- Additional storage as required for video storage
- Network: Ethernet with 1000 MBit/s. Do not team NIC’s except for fault tolerance (Bandwidth aggregation not supported)

OCULARIS MEDIA SERVER*

- CPU: Intel® Xeon® E3 Series or Intel® Core™ i5 (or better) recommended
- RAM: Minimum 8 GB (reserve 4GB for Ocullis Media Server if installing with other Ocularis applications)
- Hard Drive: 50GB or more
- Software: Microsoft .NET 4.0 Framework, .NET 4.6.2 Framework and Internet Information Services (IIS) 6.0 or newer

OCULARIS CLIENT**

- CPU: Intel Core i5™ or better
- RAM: 8 GB minimum (16 GB or more recommended)
- Software: DirectX 9.0 or newer, Microsoft .NET 4.6.2 Framework
- Graphics Adapter: PCI-Express, minimum 256 MB RAM

*May be installed on the same PC/server (all-in-one system) and is also supported in virtual environments

** Supported in virtual environments

Please visit the Online Storage and Hardware Calculator for detailed system requirements or contact us.

ABOUT

Qognify helps safeguarding your world, focusing on the outcomes of customers, who place a premium on physical security. Providing solutions to mitigate risks, increase security and optimize operations, Qognify serves thousands of customers all over the world as a trusted advisor. The comprehensive portfolio of Qognify contains physical security and incident management solutions, which create value for many sectors.

www.qognify.com

CONTACTS

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info.americas@qognify.com
info.emea@qognify.com
info.apac@qognify.com
### Door & Frame Schedule - Sets 01

<table>
<thead>
<tr>
<th>Door Type</th>
<th>Primary Door Type</th>
<th>Frame Type</th>
<th>Glazing</th>
<th>Special Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Door & Window Abbreviations:

- **NA:104B**: Hollow Metal
- **NA:107A**: Hollow Metal
- **NA:112B**: Laminated
- **NA:113A**: Painted
- **NA:123A**: Glazed
- **NA:124A**: H/S
- **NA:125A**: H/S
- **NA:127A**: H/S
- **NA:128A**: H/S
- **NB:110A**: Hollow Metal
- **NB:112A**: Hollow Metal
- **NB:119A**: Hollow Metal
- **NC:101B**: Hollow Metal
- **NC:113A**: Hollow Metal
- **NC:117A**: Hollow Metal
- **NC:118A**: Hollow Metal
- **ND:102A**: Hollow Metal
- **ND:118A**: Hollow Metal
- **ND:124A**: Hollow Metal
- **ND:130A**: Hollow Metal
- **ND:131A**: Hollow Metal
- **ND:138B**: Hollow Metal

#### General Reference Notes:

- **DOOR TYPE**: Door Type
- **FRAME TYPE**: Frame Type
- **GLAZING**: Glazing Type
- **SPECIAL CONDITION**: Special Condition

---

**Building Submittal - Addendum-001**

**Pinal County San Tan Valley Complex**

31500 N Schnepf Rd Bldg A

San Tan Valley, AZ 85143

SPR:PA-04-19 PER:0326

12/4/2019
### DOOR & FRAME SCHEDULE - SETS 01

**Columns:**
- Door Type
- Side
- Construction
- Frame
- Gauge
- Finish
- Glazing Type
- Glazed From
- Comment

- **Door Type:**
  - Hinge Side
  - Paracentric Stop Side
  - 12/4/2019

- **Side:**
  - SC110C F
  - SD134B N1
  - SD134A F
  - SD132A F
  - SD126A F
  - SD124A F
  - SD123A F
  - SD122A F
  - SD121A F
  - SD117A FG
  - SD111A F
  - SD108A FG
  - SD106B F
  - SD106A F
  - SD104A G
  - SD101A FG
  - SC117A FG
  - SC113B FG
  - SC113A N1
  - SC108A FG
  - SC107A FG
  - SC103A FG
  - SC102A F
  - SA116D G
  - SA116C G
  - SB120A F
  - SB117A FG
  - SB116A FG
  - SB113A FG
  - SB112A FG
  - SB110A FG
  - SA119A FG
  - SA117A FG
  - SA116B F
  - SA108A FG
  - SA106A FG
  - SA101B FG

- **Side Details:**
  - Hinge Side
  - Paracentric Stop Side
  - 12/4/2019

- **Construction:**
  - 1 - 3'-0" 7'-0" 1 3/4" WD - ST
  - 1 - 3'-0" 7'-0" 1 3/4" WD - ST
  - 1 - 3'-0" 7'-0" 1 3/4" WD - ST
  - 1 - 3'-0" 7'-0" 1 3/4" WD - ST
  - 1 - 3'-0" 7'-0" 1 3/4" WD - ST
  - 1 - 3'-0" 7'-0" 1 3/4" WD - ST
  - 1 - 3'-0" 7'-0" 1 3/4" WD - ST
  - 1 - 3'-0" 7'-0" 1 3/4" WD - ST

- **Frame Details:**
  - 6" HM 16 PT
  - 6" HM 16 PT
  - 6" HM 16 PT
  - 6" HM 16 PT
  - 6" HM 16 PT
  - 6" HM 16 PT
  - 6" HM 16 PT
  - 6" HM 16 PT

- **Gauge Details:**
  - G-01
  - G-01
  - G-01
  - G-01
  - G-01
  - G-01
  - G-01
  - G-01

- **Finish Details:**
  - F01A
  - F01B
  - F01B
  - F01B
  - F01B
  - F01A
  - F01B
  - F01B

- **Glazing Type Details:**
  - G-01
  - G-01
  - G-01
  - G-01
  - G-01
  - G-01
  - G-01
  - G-01

- **Glazed From Details:**
  - 217 218 219
  - 217 218 219
  - 217 218 219
  - 217 218 219
  - 217 218 219
  - 217 218 219
  - 217 218 219
  - 217 218 219

- **Comment Details:**
  - 217 218 219
  - 217 218 219
  - 217 218 219
  - 217 218 219
  - 217 218 219
  - 217 218 219
  - 217 218 219
  - 217 218 219

### DOOR & WINDOW ABBREVIATIONS:
- H: Hinge Side
- ST: Paracentric Stop Side
- PR: Primed
- LM: Laminate
- AN: Anodized
- NOTE: REFER TO FINISH LEGEND FOR SPECIFIC INFO.

### WINDOW SCHEDULE

**Columns:**
- Window Type
- Side
- Construction
- Frame
- Gauge
- Finish
- Glazing Type
- Glazed From
- Comment

- **Window Type:**
  - WSD109A WF01A
  - WSD103A WF05A
  - WSC114A WF01A
  - WSC113B WF01A
  - WSC113A WF01A
  - WSC107A WF01A
  - WSB116A WF01A
  - WSB113B WF01A
  - WSB112A WF01A
  - WSB110A WF01A
  - WSB106A WF01A
  - WSA104A WF01A
  - WSA116A WF01A
  - WSA113B WF01A
  - WSA112A WF01A
  - WSA110A WF01A

- **Side Details:**
  - 1/4" DOUBLE PANED TINTED LOW-E COATING (#2 FACE) EXTERIOR

- **Construction Details:**
  - 6'-0" 2'-0" 5'-4" 6" HM 16 PT G-02
  - 6'-0" 4'-0" 2'-10" 6" HM 16 PT G-02
  - 6'-0" 2'-0" 5'-4" 6" HM 16 PT G-02

- **Gauge Details:**
  - 201 202 207
  - 203 204 207
  - 203 204 207

- **Finish Details:**
  - G-01
  - G-02
  - G-01

- **Glazing Type Details:**
  - G-01
  - G-02
  - G-01

- **Glazed From Details:**
  - 201 202 207
  - 203 204 207
  - 203 204 207

- **Comment Details:**
  - 201 202 207
  - 203 204 207
  - 203 204 207

### GLAZING TYPES SCHEDULE

**Columns:**
- Type
- Assembly
- Description
- Depth
- Comments

- **Type Details:**
  - 1/4" DOUBLE PANED TINTED LOW-E COATING (#2 FACE) EXTERIOR

- **Assembly Details:**
  - 6'-0" 2'-0" 5'-4" 6" HM 16 PT G-02
  - 6'-0" 4'-0" 2'-10" 6" HM 16 PT G-02
  - 6'-0" 2'-0" 5'-4" 6" HM 16 PT G-02

- **Description Details:**
  - WINDOW

- **Depth Details:**
  - 2'-0" 5'-4" 6" HM 16 PT G-02
  - 4'-0" 2'-10" 6" HM 16 PT G-02
  - 2'-0" 5'-4" 6" HM 16 PT G-02

- **Comments Details:**
  - 2'-0" 5'-4" 6" HM 16 PT G-02
  - 4'-0" 2'-10" 6" HM 16 PT G-02
  - 2'-0" 5'-4" 6" HM 16 PT G-02

### GENERAL REFERENCE NOTES
- REFER TO DOOR TYPES ON SHEET
- REFER TO WINDOW TYPES ON SHEET
- REFER TO DOOR PANEL TYPES ON SHEET
- REFER TO WINDOW PANEL TYPES ON SHEET
- REFER TO DOOR FRAME TYPES ON SHEET
- REFER TO WINDOW FRAME TYPES ON SHEET
- REFER TO DOOR STOP TYPES ON SHEET
- REFER TO WINDOW STOP TYPES ON SHEET
- REFER TO LAMINATED GLASS TYPES ON SHEET
- REFER TO LOW-E COATING TYPES ON SHEET
- REFER TO ANODIZED TYPES ON SHEET

### HINGE SIDE / STOP SIDE GRAPHIC:

- STOP SIZE OF DOOR
- STOP SIZE OF WINDOW
- STOP SIZE OF FRAME

### SHEET TITLE:

- DESIGNED BY:
- PROJECT NO.:
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**Material Finish Legend**

- **Room**
- **Room Name**
- **Floor**
- **Finish**
- **Comments**

**Notes:**
1. Epoxy to 4" above ceiling grid.
2. Epoxy to be a min. of 6'-0" above.
3. Epoxy to be min. of 4'-0" above.
4. CMU bench base to include Epoxy wall finish.

**Acoustic Ceiling Panels**
- Armstrong Metalworks Perforated Metalworks
- Secured Lock

**CMU Running Bond**
- Trendstone Mission White
- Durango
- Opal

**Epoxy Walls with Paint**
- Duraflex Dur-A-Wall
- Color: Slate Gray
- Integral Cove Base
- Color: Smoke/Blue/Slate Gray Mix
- Integral Cove Base

**Fiberglass Reinforced Plastic**
- Wall Crane Composite

**Gypsum Board Ceiling**
- TBD
- Moisture & Mold Resistant, Smooth Level 5

**Luxury Vinyl Tile**
- Mohawk 959 Grey Granite

**Interior Paint**

**Rubber Wall Base Trim**
- Roppe 6" Black"