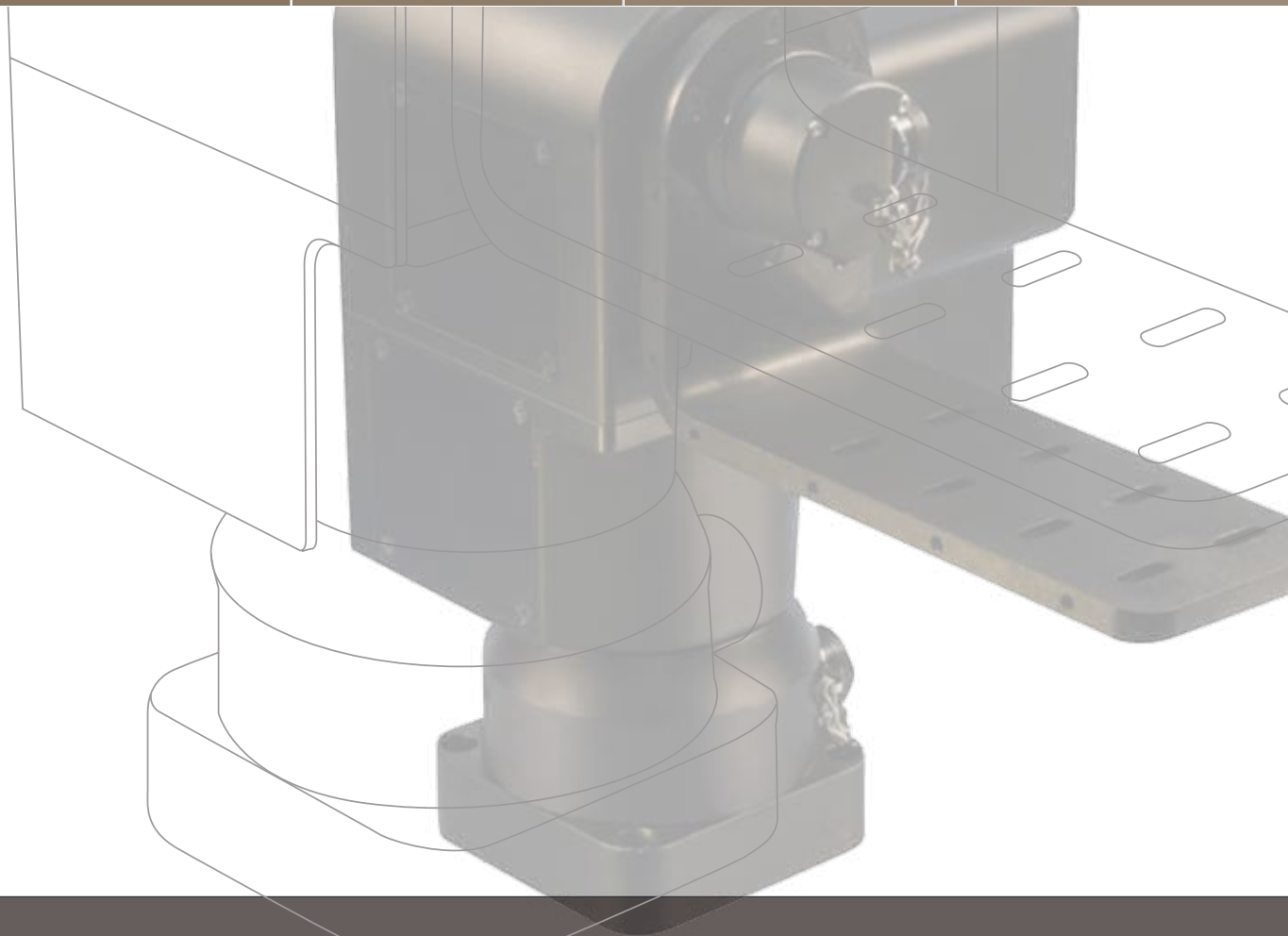




Motion Control Systems



High-Performance Pan/Tilts

Precise real-time pointing of any payload

FLIR Motion Control Systems, Inc. (MCS) offers a complete line of high-performance pan/tilt devices for real-time, computer-controlled positioning of virtually any payload including thermal cameras, video cameras, IP cameras, laser rangefinders, and microwave antennas. Whatever your motion control device needs, MCS's innovative technology and years of application experience can help you create the optimal solution.

Four primary MCS product families are continually evolving to meet your specific needs:

- PTU-D300 Family: A versatile group of highly adaptable pan/tilt devices designed to carry very heavy, multi-part payloads including multi-sensor camera systems and antennas as well as payloads on the move.
- PTU-D100 Family: Mid-range pan/tilt models for payloads up to 25 pounds featuring compact size and multiple mounting options for fixed and mobile applications.
- PTU-48 Family: Compact, lightweight, rugged pan/tilt for payloads up to 15 pounds, ideal for mast-mounted and mobile applications.
- PTU-D46/47 Family: Miniature, computer-controlled pan/tilts offer off-the-shelf solutions for positioning of any type of small sensor or other payload up to 12 pounds in an extremely small, lightweight package.

FLIR Motion Control Systems pan/tilt units help lower your development risk and increase your first-time application success through innovation, adaptability, quality, and durability.

Customized solutions to meet a wide range of requirements

The MCS engineering staff will work with you to define an optimal solution whether it is a small modification to one of our standard products, a completely new design, or an integration with other system components. The MCS team has broad expertise in electro-mechanical design, embedded and enterprise software design and development, communications, computer vision, robotics and control systems, and more. The MCS high-volume manufacturing process assures that you will receive high-quality products delivered when needed.



Advanced Features and Applications

The **Inertial Stabilization Module (ISM)** is available as an option for select FLIR MCS pan/tilt models. It provides a complete turn-key integrated solution for low-cost inertial Line of Sight (LOS) stabilization of any payload from mobile platforms including ground, air, and sea. For camera applications, inertial stabilization improves images while on the move. The ISM allows real-time computer control during stabilization, enabling closed loop systems for tracking and slew-to-cue. The ISM provides impressive performance at breakthrough cost points, allowing stabilization to be used in a much broader range of applications. The stabilization provided by the ISM allows the use of higher zoom cameras and is critical for operation of automated video tracking and detection systems aboard moving platforms.

- Low-cost inertial stabilization for MCS pan/tilt units
- Real-time control from computer or joystick while stabilized
- Complementary to electronic image stabilization

The **Geo-Pointing Module (PTU-DGPM)** is an intelligent module that allows any FLIR MCS pan/tilt unit to be commanded using latitude, longitude, and altitude coordinates (geo-coordinates or GPS coordinates). Once configured, it accepts geo-coordinates over the built-in Ethernet/IP interface and automatically commands the pan/tilt to aim at the corresponding location. This is a powerful capability that greatly simplifies systems integration and allows efficient coordination of multiple sensors and systems. Several cameras/sensors can easily be commanded to look at a single position by simply sending the same GPS command to all PTU-DGPM-enabled pan/tilt units. The Geo-Pointing Module allows control of FLIR MCS pan/tilts from any geo-spatial or map-based user interface (e.g., Google Earth).

- Automatically point pan/tilt at GPS coordinate
- Web interface for configuration and pan/tilt control
- Control all pan/tilt functions over Ethernet/IP

Controllers and Software

All MCS pan/tilts support a real-time, two-way control of position, speed, and acceleration and can be controlled by joystick or direct computer interfaces. Desktop joystick options are available for the PTU-D46 models. A ruggedized joystick controller option is available for PTU-D47, PTU-D48, PTU-D100, and PTU-D300 models. All units provide serial pan/tilt computer control interface (RS-232 and/or RS-485) with ASCII and binary control protocols. The PTU C Language Interface allows you to write custom programs that directly control MCS pan/tilts with high performance. A web-based graphical control interface and IP command interface is also available on select FLIR MCS pan/tilt models.



The PTU-300-ISM positioning an Optical Tracker on a Chilean Navy vessel.

Applications: Partnering for Precision Positioning

MCS serves both systems integrators and OEMs in a wide variety of mission-critical applications including:

Security and Surveillance

Vumii, night-vision surveillance experts, needed a solid, flexible motion and control platform for their advanced camera surveillance system. FLIR MCS's multiple pan/tilt product lines delivered a broad range of size, price, and performance options while meeting Vumii's requirements for advanced real-time control features, accuracy durability, and reliability. More information at:

http://www.FLIR.com/mcs/pdf/Vumii_CustomerStory.pdf

Automated Tracking for Maritime Situational Awareness

The PTU-D300-ISM provides a stabilized, high-performance pan/tilt tracking mount for situational awareness aboard an Ocean Patrol Vessel (OPV) for the Chilean Navy. The system incorporates daylight and thermal cameras and operates in the harsh deck environment of a navy vessel. More information at:

http://www.FLIR.com/mcs/pdf/DESA_CustomerStory.pdf

Robotics

Concept Systems' Automatic Launch & Recovery System (AutoLARS) is an automated machine vision and control system that recovers objects from seagoing vessels. AutoLARS deployed FLIR MCS's precise, kinematically rigid pan/tilt PTU-D46 models to support the real-time control and geometry of their vision subsystem in order to derive XYZ position and target location. More information at:

<http://www.FLIR.com/mcs/pdf/ConceptSystems-customer-story.pdf>

Communications

The Harris engineering team needed a pan/tilt solution to automatically aim their system based on GPS positions from a mobile platform. FLIR MCS's PTU-D300 unit and Geo-Pointing-Module (GPM) fitted with a dual-GPS heading sensor and MEMs gyro were able to automate calibration and provide real-time Ethernet transmission of ground and airborne targets coordinates. More information at:

http://www.FLIR.com/mcs/pdf/Harris_CustomerStory.pdf



Both D100 and D300 units are integrated into Vumii's advanced night vision surveillance systems.



Unmanned Ground Vehicle for military operations



Cornell University's UAV team used the PTU-D46-17 in their prize-winning entry that featured stabilized video capture.

Border Security

McQ, an industry leader in remote surveillance, security, and environmental monitoring products, needed a pan/tilt platform with efficient battery power, small form factor, light weight, and durability in harsh environments to position the camera in one of their advanced systems. FLIR MCS's PTU-D46 computer-controlled pan/tilt family was an ideal match, providing an off-the-shelf platform with high quality, flexibility, and reliability. More information at:

http://www.FLIR.com/mcs/pdf/McQ_CustomerStory.pdf

Automated Threat Detection

Qinetiq selected the PTU-D300 as the core of their SPO-7R, a passive millimeter wave detection sensor for threat detection in airports. More information at:

http://www.FLIR.com/mcs/pdf/TSA_CustomerStory.pdf

Automated Test in Military, Aerospace, and Industrial Markets

The U.S. Army's Yuma Test Center (YTC) needed to streamline aging, disparate systems into a single system that integrated commercially-available hardware with a new software application in order to provide automated electronic data acquisition, calibration, and computer control of velocimeter antennas and IR flash detectors. Multiple FLIR MCS's PTU-D300s, with their flexible payload mounting, rugged design, and built-in computers, were networked to provide coordinated, single-point control during test procedures. More information at:

http://www.FLIR.com/mcs/pdf/Yuma_CustomerStory.pdf



The PTU-D-300 is a key component in Qinetiq's stand-off detection system for the TSA.



The U.S. Army needed a rugged positioner that could be deployed adjacent to weapons at the Yuma Test Center.

For additional case history success stories visit the FLIR MCS website at <http://www.FLIR.com/mcs/pdf/application>.

Precision. Speed. Reliability.

A high-performance pan/tilt device for your application

High speed, precision, durability, and small form factors are integral in the design and performance of every MSC product. All MCS devices feature:

- Dynamic Rigidity, Precise Geometry: Aluminum pan/tilt body construction that provides very rigid, repeatable positioning
- 100% duty-cycle design: Stepper motors with an asymmetrical worm-gear design for maximal performance
- Wide range of pan speeds ($< 0.006^\circ/\text{sec}$ to $300^\circ/\text{sec}$)
- Wide temperature specs, all-weather
- Flexible mounting of any payload
- Real-time computer control interface
- Rich command set (ASCII and binary) providing fine-grained, real-time control of position (absolute and relative), velocity, acceleration, and other unit functions
- Geo-pointing and gyro inertial stabilization
- DC power operation
- Low power consumption for battery applications

PTU-D300 Family

Extreme-duty pan/tilt for large payloads with advanced options including RF pass-through, stabilization, stainless gearing, and more. Suited for fixed and mobile, antenna, camera, and other large and multi-part payloads.



PTU-D100 Family

Mid-range, high-performance rugged pan/tilt supports multi-part payloads and internal wiring/slip-ring. Suited for fixed and mobile applications.



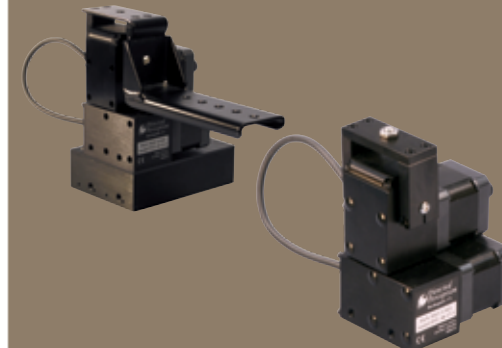
PTU-D48 Family

Small, rugged outdoor units for single and multi-part payloads with an integrated controller and continuous-pan options.



PTU-D47 and the PTU-D46 Families

Extremely small, light, and supporting payloads up to 12 pounds, the D46/D47 family is ideal for a wide range of indoor and outdoor applications.



	PTU-D300 Family	PTU-D100 Family	PTU-D48 Family	PTU-D47 and the PTU-D46 Families
Max. Payload	up to 90+ lb	up to 25 lb	up to 15 lb	up to 12 lb
Resolution	up to 0.006°	up to 0.0075°	up to 0.006°	up to 0.003°
Speed	up to 100°/sec	up to 120°/sec	up to 100°/sec	up to 300°/sec
Weight	~26-28 lb	~17 lb	~10 lb	~3-5 lb

*For detailed specifications, see the DVD in the back of this brochure.



SAIC chose the PTU-D300 for BLAST, their advanced intrusion detection system.



The PTU-D300 provides precise pointing for TSA security applications.

PTU-D300 – Tough, Flexible, and Powerful

The **PTU-D300 Family** of full-sized computer-controlled pan/tilts are designed for a wide range of outdoor fixed and mobile applications. They are compact, rugged, and offer an off-the-shelf solution for positioning of any type of sensor or other payload. The D300 family has been proven in harsh environments in a wide variety of fixed, ground vehicle, air, and sea applications.

All PTU-D300 models include the following features:

- Vibration-tolerance for vehicle-mounted applications
- Oil-filled gear train for superior long-term performance
- Extremely precise positioning that translates object positions to global coordinates accurately
- Single weatherized mil-style connector provides power, pan/tilt, and payload signals
- Precise control of position, speed, and acceleration
- Simple control from host computer via RS-232/-485
- Fully sealed for outdoor/marine applications (IP67)
- Fully integrated controller
- Built-in serial (RS-232/-422/-485) and Ethernet (E-Series models)

The **PTU-D300 Standard Model** is a computer-controlled pan/tilt unit designed for fast, accurate positioning of heavy payloads. It provides high torque for payloads up to 70 pounds while maintaining speed, precision, and a small form-factor. Its rigid design is designed for demanding applications that require up to 100% duty cycles and long life in harsh, all-weather environments.

The **PTU-D300-RF Model** provides fast, accurate positioning of antennas and other payloads. It features a DC-18Ghz RF rotary joint and slip-ring to provide continuous pan rotation. Real-time control capabilities make the D300-RF ideal for tracking applications. The durability of the D300-RF makes it suitable for demanding harsh, all-weather environments such as air, ground, or sea vehicles, and for applications that require high duty-cycles. The D300-RF features 360° continuous-pan including pass-through for DC-18 GHz RF, power, and serial/control lines.

The **PTU-D300-ISM Low-Cost Stabilized Pan/Tilt** provides stabilized pointing for virtually any type of payload. The integrated MEMs sensor is used to measure platform motion in real-time and the pan/tilt is dynamically controlled to compensate for unwanted motion. It provides line-of-sight stabilization of any type of payload aboard boats, ground vehicles, and aircraft. The D300-ISM provides real-time control while stabilized, enabling applications such as tracking, radar slew-to-cue, and joystick operation.

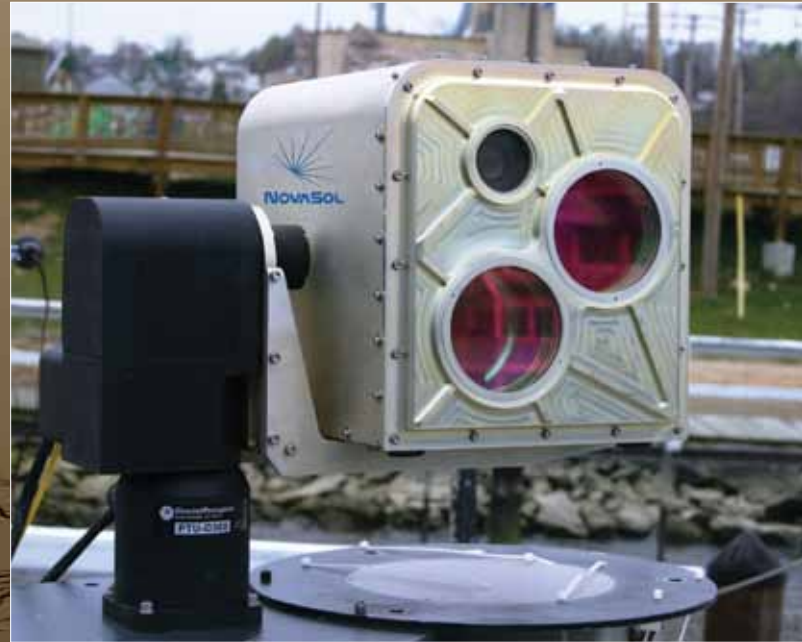
The **PTU-D300-EX** builds on the PTU-D300 family and utilizes a higher ratio, all-stainless gear drive to provide increased torque and durability. The result is increased payload capacity, and extremely low-wear over high duty cycles. The PTU-D300-EX is available in most of the PTU-D300 configurations, making it an ideal OEM platform for a wide range of applications.



	PTU-D300	PTU-D300-RF	PTU-D300-ISM	PTU-D300-EX
Max Payload (lb)	35/70 (top/side)	35/70 (top/side)	20/35 (top/side)	50/90 (top/side)
Position Resolution (°)	0.006	0.006	0.006	0.006
Max Pan Speed (°/sec)	50, 100	50, 100	50	22
Weight (lb)	26	29	28	26
Stabilization	No	Option	Yes	No
Payload Bracket	Top+Side, Top+Dual-side	Top+Side, Top+Dual-side	Top+Side, Top+Dual-side	Top+Dual-side
Payload Pass-throughs	9-12	RF (DC-18GHz) plus 9	9	9-12



SET Corporation selected the MCS D300 pan/tilt for its precision, reliability, and flexibility in payload mounting.



NovaSol uses the PTU-D300-ISM in their compact interrogator for communication between naval vessels.



FLIR MCS pan/tilts featuring our ISM module provide excellent stabilization for thermal imaging applications.

PTU-D100 — Fully integrated, advanced positioners for mid-size payloads

The **PTU-D100 Family** is comprised of compact, lightweight, rugged modular computer-controlled pan/tilt units designed for high-speed, accurate positioning and control of camera, laser, antenna, or other payloads up to 25 pounds or more. They withstand high duty-cycles and offer long life in harsh all-weather environments for fixed and mobile applications. All D100 models include the following features:

- Small form-factor and light weight
- Position resolution down to 0.0075°
- Wide range of pan speeds (< 0.0075°/sec to over 120°/sec)
- Wide range DC voltage input
- Low power consumption for battery applications
- 360° continuous-pan including pass-through for multiple cameras and other payload types (Video, IR, Laser)
- Flexible payload mounting (top, side, or dual-side)
- Fully sealed for outdoor/marine applications (IP67)
- Built-in serial (RS-232/-422/-485) and Ethernet (E-Series models)

The **PTU-D100 Standard Model** features smooth, repeatable motion and a rigid design that provides steady images and accurate visual tracking in windy environments and vehicle-mounted applications. A powerful command set supports real-time detection and tracking applications: absolute angle, relative angle, velocity control, and geo-pointing with the GPM option.

The **PTU-D100-ISM** integrates a powerful, low-cost MEMs gyro to provide active inertial stabilization of any type of payload. Stabilization improves images while on the move and allows communications links to be maintained from air, ground, or sea platforms. The PTU-D100-ISM is an ideal OEM platform for a wide range of applications including slew-to-cue, video tracking, antenna tracking, and more.

	PTU-D100 Standard	PTU-D100-ISM
Max Payload (lb)	25	20
Position Resolution (°)	0.0075	0.0075
Max Speed (°/sec)	120	120
Weight (lb)	18.5	19.5
Stabilization	No	Yes





Above and below: Both D100 and D300 units are integrated into Vumii's advanced night vision surveillance systems.



The D100 used as a pan/tilt platform for a thermal imager.



250 meters



1,400 meters



2,700 meters



PTU-D48 — Rugged, Compact, Precise

The **PTU-D48 Family** of compact pan/tilt units provide accurate real-time positioning of cameras, lasers, antenna, or other payloads up to 15 pounds. The PTU-D48 models are fully weatherized, offer integrated controller and internal wiring for payload signals, and are designed for harsh environments in fixed and mobile applications.

All D48 models include the following features:

- Low-cost, off-the-shelf solutions readily available
- Positions any payload: IP cameras, antennas, lasers
- Powerful command set supports real-time detection and tracking applications: absolute angle, relative angle, velocity control, geo-pointing (lat/long) with GPM option, continuous velocity control
- Built-in serial (RS-232/-422/-485) and Ethernet (E-Series models)
- Single connector for all video, control, power
- Integrated controller - no other electronics box required
- Slip-ring for 360°-continuous pan (optional)

The **PTU-D48** is designed for high-speed, accurate positioning of camera, laser, antenna, or other payloads up to 15 pounds. It is a fully integrated design with a single weatherized connection for power, control, and camera/payload signals. Its compact size and light weight make it ideal for mast/pole mount and vehicle applications. The PTU-D48 withstands high duty-cycles and offers long life in harsh, all-weather environments (IP67).

The **PTU-D48-DVE** is an integrated electric pan/tilt with a full digital interface designed as a drop-in solution that is fully compliant with the Driver's Vision Enhancer Family of Systems (DVE-FOS) and Forward Activity Detection System (FADS) requirements for tactical wheeled vehicles. The PTU-D48-DVE's advanced speed/acceleration control and absolute positioning meet current DVE/FADS requirements as well as future applications and offer precise, slew-to-cue functionality.



	PTU-D48	PTU-D48DVE
Max Payload (lb)	15/10 (side/top)	10
Position Resolution (°)	0.003/0.006	0.003/0.006
Max Speed (°/sec)	100/50	100/50
Wiring	Internal Option; Slip-ring option	Internal Option; Slip-ring option
Weight (lb)	< 10	< 10
Acceleration/Deceleration	On-the-fly speed and position changes.	Continuous, absolute speed command. Supports non-linear variable speed control requirement.
Stabilization	Option	Option

PTU-D47 and PTU-D46 — Miniature, Precise, Fast

The **PTU-D47** compact, lightweight, computer-controlled pan/tilt is versatile and field-proven across 100's of applications. It offers a low-cost, off-the-shelf solution for positioning of camera, laser, antenna, or other payloads up to 12 pounds. It features a fully integrated mil-style controller for power and pan/tilt control, as well as payload signal management (optional) in outdoor fixed and mobile applications. The side-mount bracket allows positioning payloads for a lower center-of-gravity, and for mounting multiple payloads (top and side).

The **PTU-D46 Family** of miniature pan/tilt units provide fast, precise positioning in an extremely small and lightweight package. They are fully computer-controlled and offer programmability of speed, acceleration, power, and other parameters. The included controller handles precise kinematic motion control according to user set parameters. The controller includes built-in RS-232 and RS-485 interfaces and the units can be networked. They accept ASCII and binary—high-speed, real-time command formats for demanding applications such as laser scanning and video tracking. The D46 family offers the following key features:

- Base with multiple mount points including 1/4 20 threaded hole for tripod mount
- Separate controller (4" x 3" x 1") can be located up to 56' away from the head
- RS-232 and RS-485 interfaces are provided on the controller (RS-485 interface supports multi-drop networking of up to 127 devices)
- Optional Geo-Pointing Module provides an Ethernet/IP control interface
- Extended I/O option allows a trackball to be connected directly to the pan/tilt unit for direct control without a computer
- Single DC power input suited for battery operation



McG, a leader in surveillance, security, and environmental monitoring products, uses the D-46 as an off-the-shelf pan/tilt platform with a great deal of versatility for their OmniSense PTZ® remote intrusion sensor system.

	PTU-D46-17	PTU-D46-70	PTU-D46-17P70T	PTU-D47
Max Payload (lb)	6	9	9	12
Position Resolution (°) (pan/tilt)	0.01	0.003	0.01/0.003	0.01/0.003
Max Speed (°/sec)	300	60	300/60	300/60
Weight (lb)	3	3	3	5.4

About FLIR Motion Control Systems

Founded with a mission to be a leading manufacturer of innovative devices and software for the intelligent control of sensors and sensor processing, FLIR Motion Control Systems, Inc. (formerly Directed Perception) created one of the first miniature computer-controlled pan/tilt tracking mounts in 1992. FLIR MCS continues to lead the field in innovation, applied design, and service with patented products in use in a wide range of industries including Security & Surveillance, Industrial Automation, Robotics, Communications, Military/Aerospace, Law Enforcement, Education, R&D, Webcams, and Teleconferencing/Distance Learning applications. Our pan/tilt devices provide precise control of sensors like video cameras, thermal imagers, laser rangefinders, microwave antennas, and many more. MCS maintains engineering capabilities in mechanical design, electronics, and embedded and network software development. Find out more at www.FLIR.com/mcs.

About FLIR

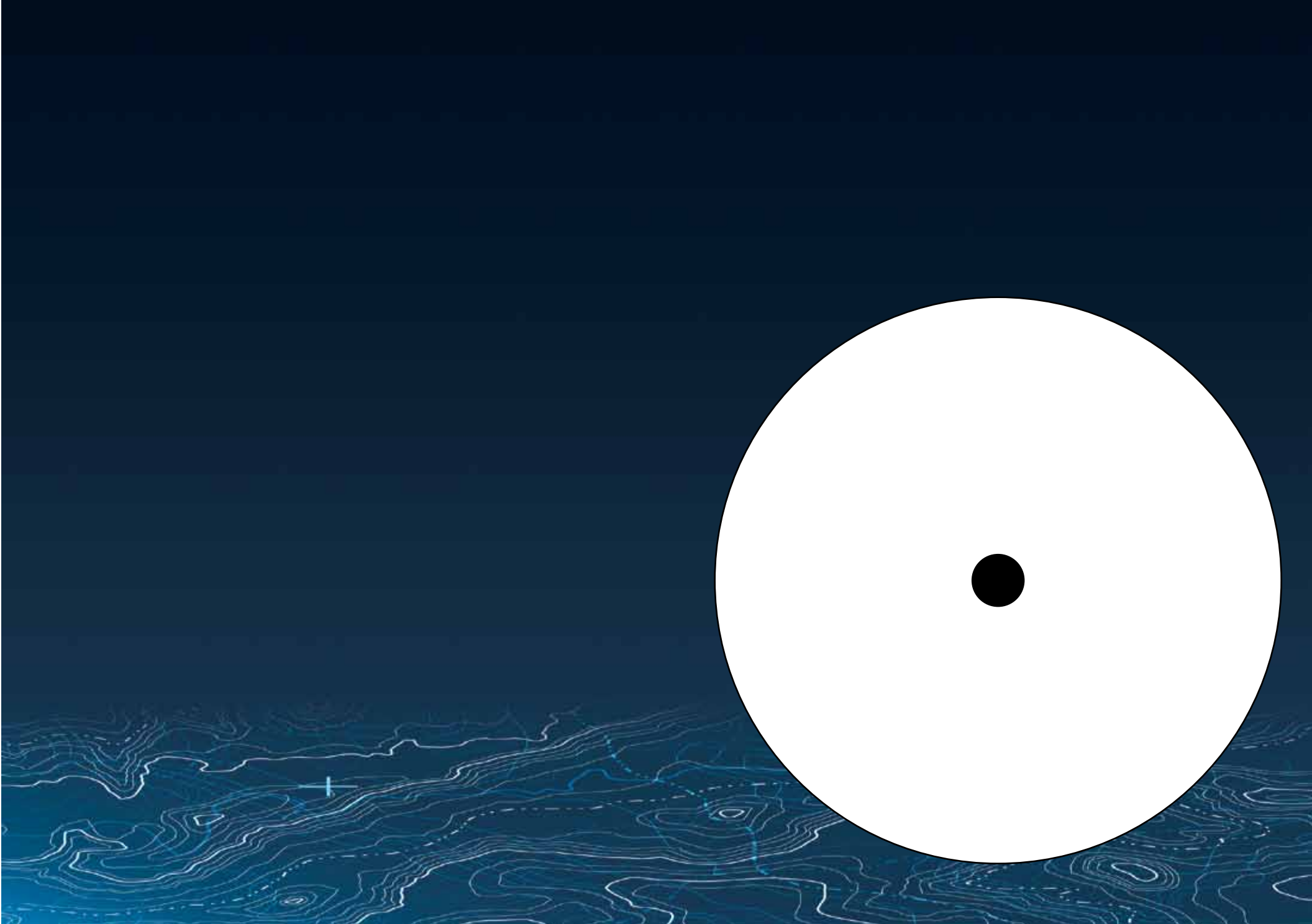
As the world's largest commercial infrared company, FLIR Systems has fielded more high quality thermal night vision systems than anyone in the world. Our rugged, stabilized imagers are on thousands of civil and military platforms – surface and airborne – in the US and around the world. That's more than every other manufacturer combined.

With thousands of our thermal cameras on the job in military, scientific, law enforcement, and security applications, FLIR brings an unmatched level of experience and dedication to the creation of cutting edge thermal night vision systems.

We design and manufacture all of the critical technologies inside our products, including detectors, electronics, special lenses, pan/tilt motion control systems, and we assemble it all right here in the US.

For additional technical information, or to see a demonstration of these revolutionary thermal night vision systems, contact a FLIR representative today. You can also visit www.FLIR.com to watch product videos and see how thermal imaging can keep you on the water, night and day.







SAN FRANCISCO

FLIR Systems, Inc.
890C Cowan Rd.
Burlingame, CA 94010
USA
PH: + 1 650.692.3900 (Sales)
FX: + 1 650.692.3930
www.FLIR.com/MCS
mcs@flir.com

PORTLAND
CORPORATE HEADQUARTERS

FLIR Systems, Inc.
27700 SW Parkway Ave.
Wilsonville, OR 97070
USA
PH: + 1 650.692.3900 (Sales)

SANTA BARBARA

FLIR Systems, Inc.
70 Castilian Dr.
Goleta, CA 93117
USA
PH: + 1 650.692.3900 (Sales)

THE NETHERLANDS

FLIR Systems BV
Charles Petitweg 21
4847 NW Teteringen - Breda
The Netherlands
PH: +31 (0) 765.794194

www.flir.com/mcs

Equipment described herein may require US Government authorization for export purposes. Diversion contrary to US law is prohibited. Specifications are subject to change without notice.
©2010 FLIR Systems, Inc. All rights reserved. 1001-091