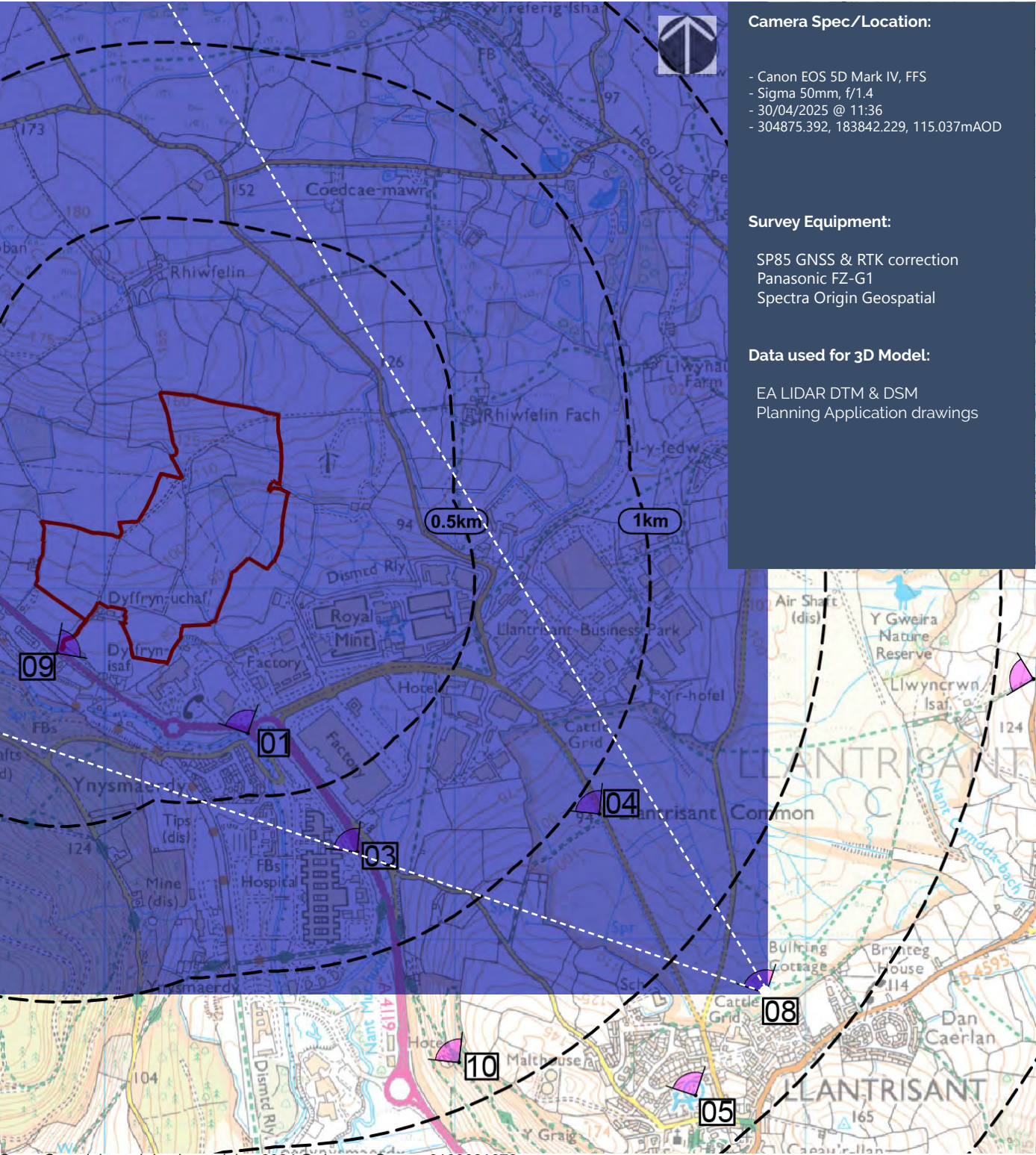


50mm Lens Planar Projection (actual 49.6mm; 39.9 deg HFOV)



Viewpoint 7 Single Frame 50mm Reference image

Camera Location:



Camera Spec/Location:

- Canon EOS 5D Mark IV, FFS
- Sigma 50mm, f/1.4
- 30/04/2025 @ 11:36
- 304875.392, 183842.229, 115.037mAOD

Survey Equipment:

- SP85 GNSS & RTK correction
- Panasonic FZ-G1
- Spectra Origin Geospatial

Data used for 3D Model:

- EA LIDAR DTM & DSM
- Planning Application drawings

Tripod:



50mm Lens Planar Projection (actual 49.6mm; 39.9 deg HFOV)



Point of Perspective

Point of Perspective

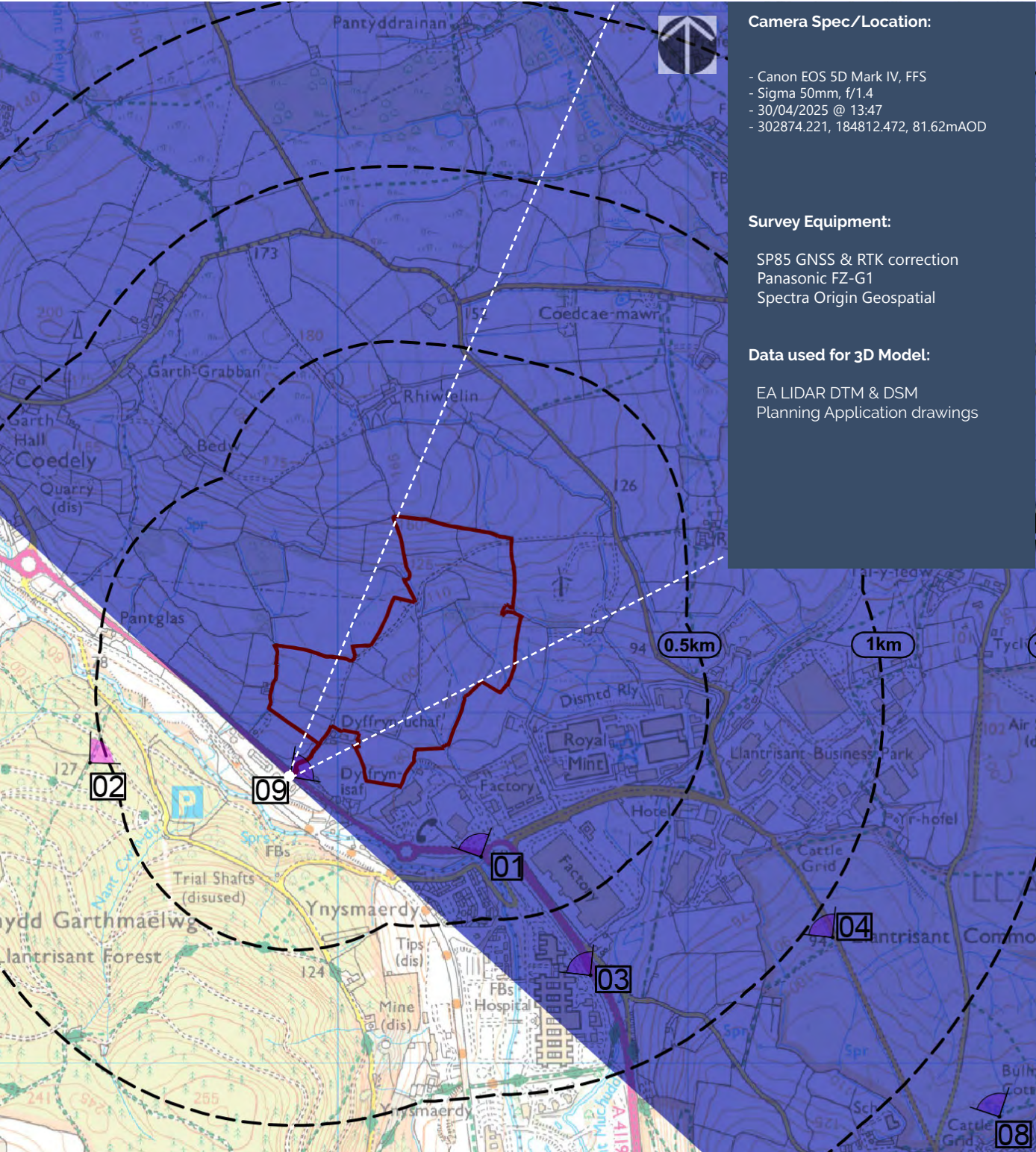
Point of Perspective

Point of Perspective

Viewpoint 8 Single Frame 50mm Reference image

Ely Valley Solar Farm

Camera Location:



Tripod:



50mm Lens Planar Projection (actual 49.6mm; 39.9 deg HFOV)

Point of Perspective



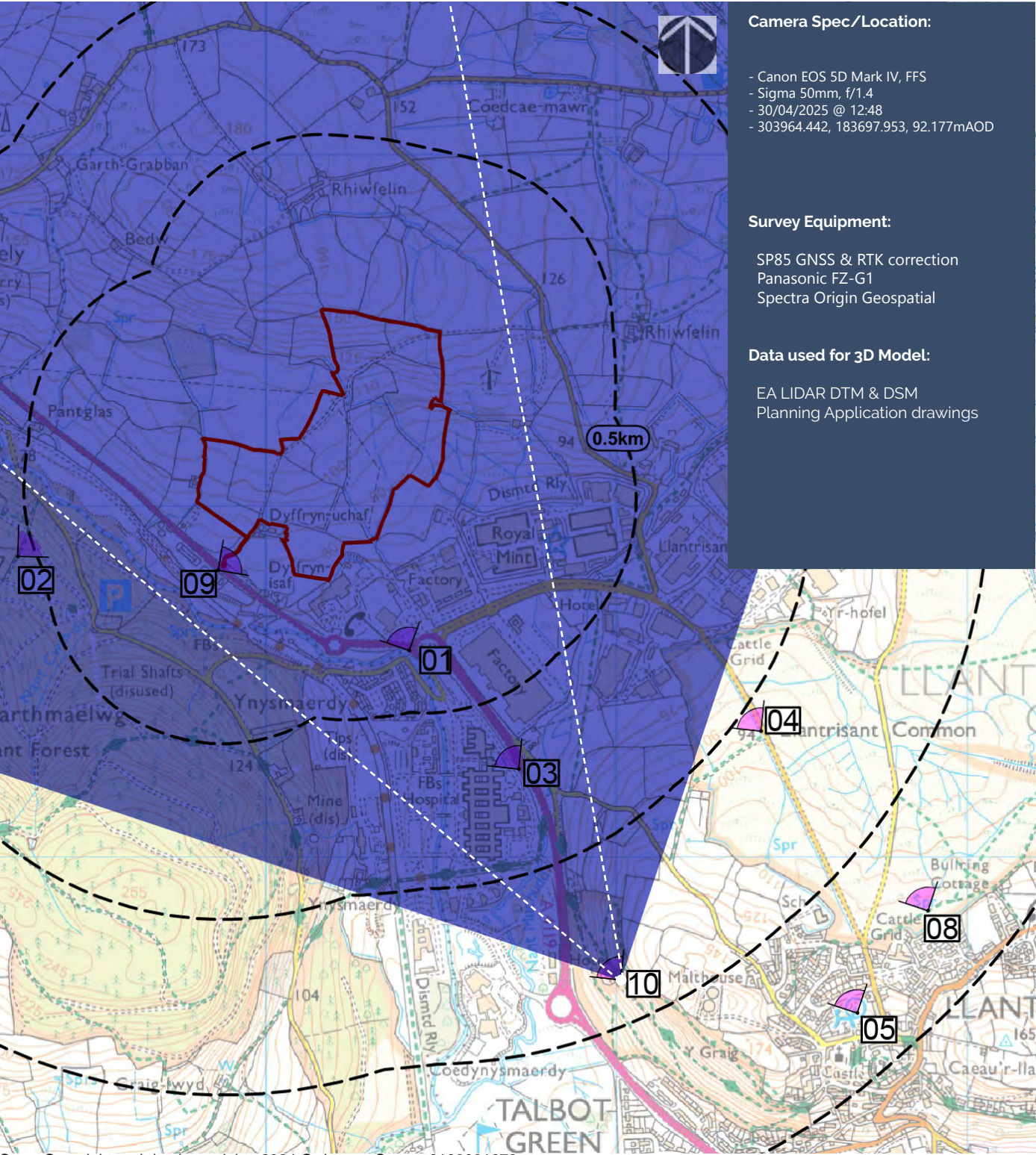
Point of Perspective

Point of Perspective

Point of Perspective

Viewpoint 9 Single Frame 50mm Reference image

Camera Location:



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Tripod:



50mm Lens Planar Projection (actual 49.6mm; 39.9 deg HFOV)



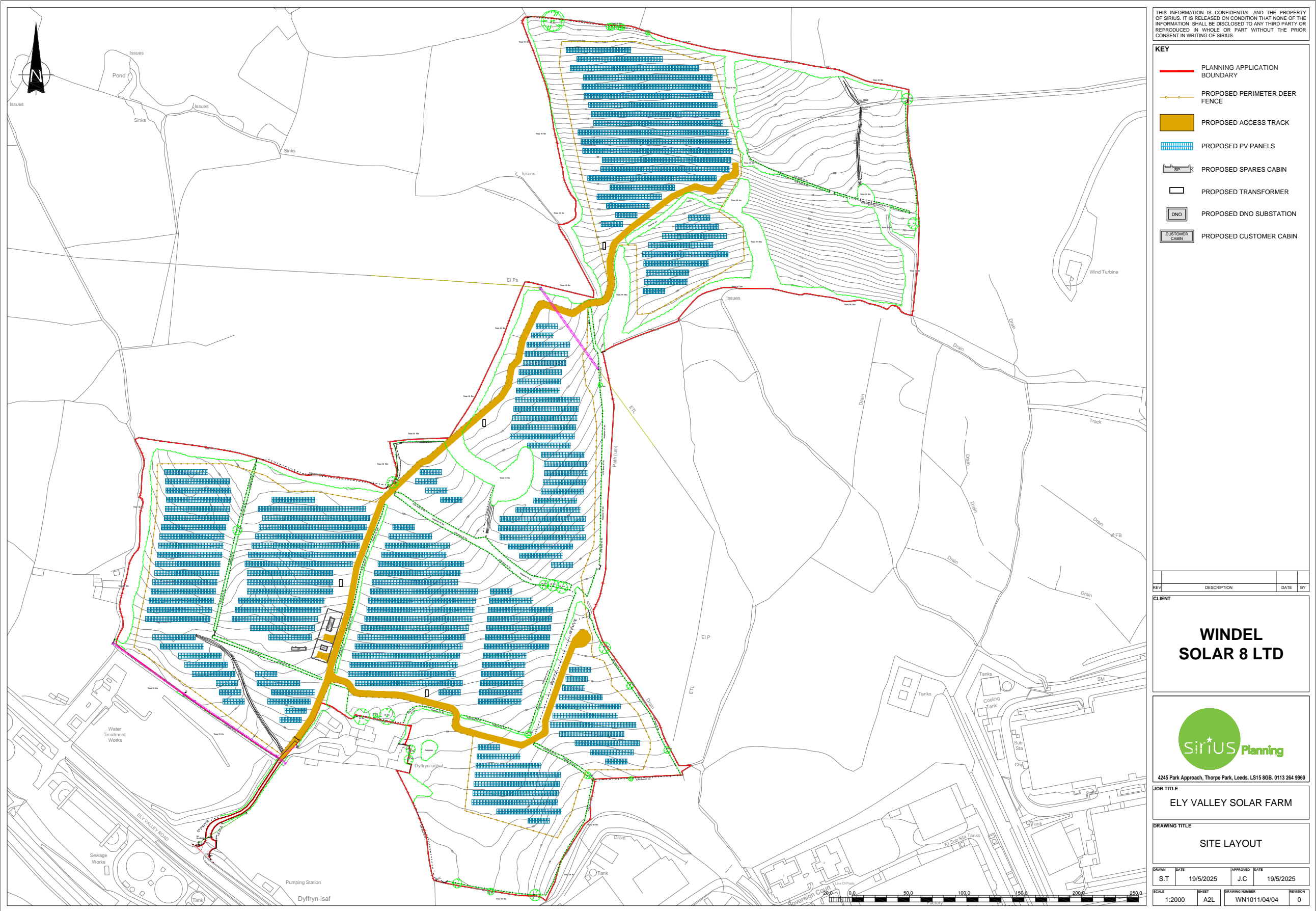
Point of Perspective

Point of Perspective

Point of Perspective

Point of Perspective

Viewpoint 10 Single Frame 50mm Reference image



SPECTRA®
GEOSPATIAL

SP85



spectrageospatial.com

UNMATCHED CONNECTIVITY

SPECTRA®
GEOSPATIAL

GNSS CHARACTERISTICS

- 600 GNSS channels
 - GPS L1C/A, L1P(Y), L2C, L2P(Y), L5
 - GLONASS L1C/A, L1P, L2C/A, L2P, L3
 - BeiDou (Phase III) B1, B2
 - Galileo E1, E5a, E5b
 - QZSS L1C/A, L1C, L2C, L5
 - IRNSS L5
 - SBAS L1C/A, L5 (WAAS, EGNOS, MSAS, GAGAN, SDCM)
 - L-band MSS
- Patented Z-Blade technology for optimal GNSS performance
 - Full utilization of signals from all 7 GNSS systems (GPS, GLONASS, BeiDou, Galileo, QZSS, IRNSS and SBAS)
 - Enhanced GNSS-centric algorithm: fully-independent GNSS signal tracking and optimal data processing, including GPS-only, GLONASS-only, Galileo-only, or BeiDou-only solution (Autonomous to full RTK)
- Fast Search engine for quick acquisition and re-acquisition of GNSS signals
- SBAS ranging for using SBAS code & carrier observations and orbits in RTK processing
- Patented Strobe™ Correlator for reduced GNSS multi-path
- Up to 20 Hz real-time raw data (code & carrier and position output)
- Supported data formats: ATOM, CMR, CMR+, RTCM 2.1, 2.2, 2.3, 3.0, 3.1 and 3.2 (including MSM), CMRx and sCMRx (rover only)
- NMEA 0183 messages output

REAL-TIME ACCURACY (RMS) ⁽¹⁾⁽²⁾⁽³⁾

SBAS (WAAS/EGNOS/MSAS/GAGAN)

- Horizontal: < 50 cm
- Vertical: < 85 cm

Real-Time DGPS position

- Horizontal: 25 cm + 1 ppm
- Vertical: 50 cm + 1 ppm

Real-Time Kinematic Position (RTK)

- Horizontal: 8 mm + 1 ppm
- Vertical: 15 mm + 1 ppm

Network RTK ⁽⁴⁾

- Horizontal: 8 mm + 0.5 ppm
- Vertical: 15 mm + 0.5 ppm

POST-PROCESSED KINEMATIC (PPK)

- Horizontal: 8 mm + 1 ppm
- Vertical: 15 mm + 1 ppm

REAL-TIME PERFORMANCE

- Instant-RTK® Initialization
 - Typically 2 sec for baselines < 20 km
 - Up to 99.9% reliability
- RTK initialization range: over 40 km

POST-PROCESSING ACCURACY (RMS) ⁽¹⁾⁽²⁾⁽³⁾

Static & Fast Static

- Horizontal: 3 mm + 0.5 ppm
- Vertical: 5 mm + 0.5 ppm

High-Precision Static ⁽⁵⁾

- Horizontal: 3 mm + 0.1 ppm
- Vertical: 3.5 mm + 0.4 ppm

DATA LOGGING CHARACTERISTICS

Recording Interval

- 0.05 - 999 seconds

PHYSICAL CHARACTERISTICS

Size

- 22.2 x 19.4 x 7.5 cm (8.7 x 7.6 x 3.0 in)

Weight

- 1.17 kg (2.57 lb)

User Interface

- Graphical PMOLED display
- WEB UI (accessible via WiFi) for easy configuration, operation, status, and data transfer

I/O Interface

- RS232 serial link
- USB 2.0/UART
- Bluetooth 5.0 dual mode
- WiFi (802.11 b/g/n)
- 3.5G quad-band GSM (850/900/1800/1900 MHz) / penta-band UMTS module (800/850/900/1900/2100 MHz)

Memory

- 4GB internal memory NAND Flash (3.5 GB user data)
- Over two years of 15 sec. raw GNSS data from 14 satellites
- SD/SDHC internal memory card (up to 32GB)

Operation

- RTK rover & base
- RTK network rover: VRS, FKP, MAC
- NTRIP, Direct IP
- CSD mode
- Post-processing
- RTK bridge
- UHF repeater
- UHF networking

Environmental Characteristics

- Operating temperature: -40° to +65°C (-40° to +149°F) ⁽⁶⁾
- Storage temperature: -40° to +85°C (-40° to +185°F) ⁽⁶⁾
- Humidity: 100% condensing
- IP67 waterproof, sealed against sand and dust
- Drop: 2m pole drop on concrete
- Shock: ETS300 019
- Vibration: MIL-STD-810F

SP85

Power Characteristics

- 2 Li-Ion hot-swappable batteries, 41.4 Wh (2 x 7.4 V, 2800 mAh)
- Battery life time (two batteries): 10 hrs (GNSS On, and GSM or UHF Rx On)
- External DC power: 9-28 V

Standard System Components

- SP85 receiver
- 2 Li-Ion batteries
- Dual battery charger, power supply and international power cord kit
- Tape measure (3.6 m / 12 ft)
- 7 cm pole extension
- USB to mini-USB cable
- Hard case
- 2 year warranty

Optional System Components

- SP85 UHF Kit (410-470 MHz 2W TRx)
- SP85 Field Power Kit
- SP85 Office Power Kit
- Data collectors
 - ST10
 - Ranger™ 7
 - Ranger™ 3
 - T41
 - MobileMapper® 60
 - MobileMapper® 50
- Field software
 - Survey Pro
 - Survey Mobile (Android)
 - SPace control app for 3rd party devices (Android)

- 1 Accuracy and TTF specifications may be affected by atmospheric conditions, signal multipath, satellite geometry and corrections availability and quality.
- 2 Performance values assume minimum of five satellites, following the procedures recommended in the product manual. High multi-path areas, high PDOP values and periods of severe atmospheric conditions may degrade performance.
- 3 Long baselines, long occupations, precise ephemeris used
- 4 At very low temperatures UHF module should not be used in the transmitter mode.
- 5 Without batteries. Batteries can be stored up to +70°C.
- 6 Network RTK PPM values are referenced to the closest physical base station.
- 7 Receiver initialization time varies based on GNSS constellation health, level of multipath, and proximity to obstructions such as large trees and buildings.

CONTACT INFORMATION:

Americas

Europe, Middle East and Africa

Asia-Pacific

Discover more: www.spectrageospatial.com

SP85
GNSS RECEIVER

The Spectra Geospatial® SP85 is a next generation GNSS receiver that combines decades of GNSS RTK technology with revolutionary new GNSS processing. Featuring the new 600-channel “7G” chipset combined with the patented Z-Blade™ technology, the SP85 system is optimized for tracking and processing signals from all GNSS constellations in challenging environments. With unmatched connectivity in the GNSS receiver market, the SP85 offers a unique combination of integrated 3.5G cellular, WiFi and UHF communications with SMS, email and anti-theft technology. These powerful capabilities, packaged in an ultra-rugged housing and patented antenna design, make SP85 an extremely versatile turnkey solution that can be used with unlimited operation time because of the SP85’s hot-swappable, dual battery setup.



KEY FEATURES

- Patented Z-Blade™ technology
- 600-channel 7G ASIC
- Hot-swappable batteries
- Internal TxRx UHF radio
- L-band satellite capable GNSS antenna
- 3.5G cellular modem
- Built-in WiFi communication
- SMS and e-mail alerts
- Anti-theft technology
- Backup RTK
- RTK bridge
- eLevel technology
- Up to 20 Hz update rate

UNIQUE 7G GNSS-CENTRIC TECHNOLOGY

Patented Z-Blade processing technology running on a next generation Spectra Geospatial 600-channel 7G ASIC fully utilizes all 6 GNSS systems: GPS, GLONASS, BeiDou, Galileo, QZSS, IRNSS and SBAS, in addition to MSS corrections delivered via L-band. Unlike GPS-centric technology which requires a minimum number of GPS satellites for GNSS processing, Z-Blade™ unique GNSS-centric capability optimally combines GNSS signals without dependency on any specific GNSS system; this allows SP85 to operate in GPS-only, GLONASS-only, Galileo-only or BeiDou-only mode if needed. In addition, SP85 supports RTCM 3.2 Multiple Signal Messages (MSM), a standardized definition for broadcasting all GNSS signals from space, regardless of their constellation. This protects the surveyor’s investment well into the future by providing superior performance and improved productivity as new signals become available.

SMS AND EMAIL MESSAGING

SP85 has a unique combination of communication technologies including an integrated 3.5G GSM/UMTS modem, Bluetooth and WiFi connectivity, and optional internal UHF transmit radio, providing unmatched connectivity for the user. The cellular modem may be used for SMS (text message) and e-mail alerts as well as regular Internet or VRS connectivity. SMS (text messages) can be used to monitor and configure the receiver. Likewise, SP85 can use all available RTK correction sources and connect to the Internet from the field using WiFi hotspots, where available. The internal UHF transmit/receive radio allows for quick and easy setup as a local base station. This saves time and increases the surveyor’s efficiency, allowing for more productive workflows.

ANTI-THEFT PROTECTION

A unique anti-theft technology secures the SP85 receiver when installed as a field base station in remote or public areas and can detect if the receiver has been disturbed, moved, or stolen. This technology allows the surveyor to lock the device to a specific location and make it unusable if the device is moved elsewhere. In this case, the SP85 receiver will generate an audio alert and show an alert message on its display. Additionally, a SMS or e-mail will be sent to the surveyor’s mobile phone or computer and provides the receiver’s current coordinates to allow tracking of its position and follow for a quick recovery of the receiver. SP85’s anti-theft technology provides surveyors with remote security and peace of mind.

THE MOST POWERFUL TOOL FOR RELIABLE FIELD USE

The SP85’s rugged housing, created by Spectra Geospatial’s engineering design lab in France, incorporates a host of practical innovations. Dual hot-swappable batteries can be easily exchanged in the field as a one hand operation for an interruption-free working day, ensuring surveyors remain productive until the job is done. The impact-resistant fiberglass reinforced casing, designed to withstand 2 metre pole drops and waterproof to IP67, ensures that SP85 can handle the toughest outdoor conditions. The patented UHF antenna, set inside the rugged carbon fiber rod, extends the range of RTK radio performance at the same time as armoring protection. The sunlight-readable display offers instant access to key information like the number of satellites, RTK status, battery charge and available memory. With eLevel technology, the user is able to focus in one place when leveling and measuring as well as automatically store measurements when the receiver is level. These powerful design features combine to make SP85 the most capable, most reliable GNSS receiver, backed by a comprehensive standard 2 year warranty.



Patented
inside-the-rod
mounted UHF
antenna design



THE SPECTRA GEOSPATIAL EXPERIENCE

With the most advanced and rugged field data collectors from Spectra Geospatial, surveyors get maximum productivity and reliability every day. Spectra Geospatial Survey Pro software is specifically tailored for the SP85 GNSS receiver providing easy-to-use, yet powerful GNSS workflows, letting the surveyor concentrate on getting the job done. Spectra Geospatial Survey Office Software provides a complete office suite for post-processing GNSS data and adjusting survey data, as well as exporting the processed results directly back to the field or to engineering design software packages. Combined with Spectra Geospatial field and office software, SP85 is an extremely powerful and complete solution.

APPENDIX 1.3: SURVEY EQUIPMENT



TOUGHPAD FZ-G1

Panasonic recommends Windows.

SOFTWARE	<ul style="list-style-type: none">Windows 10 Pro 64 bitPanasonic Utilities (including Dashboard), Recovery Partition		
DURABILITY	<ul style="list-style-type: none">MIL-STD-810G certified (4' drop, shock, vibration, rain, dust, sand, altitude, freeze/thaw, high/low temperature, temperature shock, humidity, explosive atmosphere)IP65 certified sealed all-weather designOptional class I division 2, groups ABCD certified modelSolid state drive heaterMagnesium alloy chassis encased with ABS and elastomer corner guardsOptional hand strap or rotating hand strapPort coversRaised bezel for LCD impact protectionPre-installed replaceable screen film for LCD protection		
CPU	<ul style="list-style-type: none">Intel® Core™ i5-6300U vPro™ Processor~ 2.4 GHz up to 3.0 GHz with Intel® Turbo Boost Technology~ Intel Smart Cache 3MB		
STORAGE & MEMORY	<ul style="list-style-type: none">8GB DDR3L SDRAM^{1,5}256GB solid state drive (SSD) with heater^{1,5}Optional 512GB~ up to 64GB additional storage with optional microSDXC card slot		
DISPLAY	<ul style="list-style-type: none">10.1" WUXGA 1920 x 1200 with LED backlighting10-point capacitive multi touch + Waterproof Digitizer pen daylight-readable screen~ 2-800 nitIPS display with direct bonding~ Anti-reflective and anti-glare screen treatments~ Ambient light sensor, digital compass, gyro and acceleration sensors~ Automatic screen rotation~ Intel® HD Graphics 520 (Built-in CPU) video controller~ Concealed mode (configurable)		
AUDIO	<ul style="list-style-type: none">Integrated microphoneRealtek high-definition audioIntegrated speakerOn-screen and button volume and mute controls		
KEYBOARD & INPUT	<ul style="list-style-type: none">10-point gloved multi touch + digitizer screen~ Supports bare-hand touch and gestures and electronic waterproof stylus pen~ Supports glove mode and wet-touch mode~ 7 tablet buttons (2 user-definable)~ Integrated stylus holder~ On-screen QWERTY keyboard		
CAMERAS	<ul style="list-style-type: none">720p webcam with mic8MP rear camera with autofocus and LED light		
EXPANSION	<ul style="list-style-type: none">Optional MicroSDXC3		
INTERFACE	<table><tr><td><ul style="list-style-type: none">Docking connectorHDMIHeadphones/speakerOptional Serial Dongle⁷USB 3.0 (x 1)⁷Optional second USB 2.0⁷Optional 10/100/1000 Ethernet⁷</td><td><ul style="list-style-type: none">24-pin Type AMini-jack stereoD-sub 9-pin4-pin4-pinRJ-45</td></tr></table>	<ul style="list-style-type: none">Docking connectorHDMIHeadphones/speakerOptional Serial Dongle⁷USB 3.0 (x 1)⁷Optional second USB 2.0⁷Optional 10/100/1000 Ethernet⁷	<ul style="list-style-type: none">24-pin Type AMini-jack stereoD-sub 9-pin4-pin4-pinRJ-45
<ul style="list-style-type: none">Docking connectorHDMIHeadphones/speakerOptional Serial Dongle⁷USB 3.0 (x 1)⁷Optional second USB 2.0⁷Optional 10/100/1000 Ethernet⁷	<ul style="list-style-type: none">24-pin Type AMini-jack stereoD-sub 9-pin4-pin4-pinRJ-45		
WIRELESS	<ul style="list-style-type: none">Optional integrated 4G LTE multi carrier mobile broadband with satellite GPSOptional GPS (u-blox NEO M8N)⁷Intel® Dual Band Wireless-AC 8260 (IEEE802.11 a/b/g/n/ac)Bluetooth v4.1, Classic mode/Low Energy mode, Class 1 (Windows 10 pro 64-bit)Security<ul style="list-style-type: none">~ Authentication: LEAP, WPA, 802.1x, EAP-TLS, EAP-FAST, PEAP~ Encryption: CKIP, TKIP, 128-bit and 64-bit WEP, Hardware AESDual high-gain antenna pass-through		
POWER SUPPLY	<ul style="list-style-type: none">Li-Ion battery pack:<ul style="list-style-type: none">~ Standard battery: Li-ion 11.1 V, 4200 mAh (typ.), 4080 mAh (min.)~ Optional long life battery⁷: Li-ion 10.8V, 9300mAh(typ.), 8700mAh (min.)Battery operation⁷:<ul style="list-style-type: none">~ Standard battery: 14 hours~ Optional long life battery⁷: 28 hoursBattery charging time⁷:<ul style="list-style-type: none">~ Standard battery: 2.5 hours off, 3 hours on~ Optional long life battery⁷: 3 hours off, 4 hours onOptional bridge battery⁷ (1 minute swap time)		
POWER MANAGEMENT	<ul style="list-style-type: none">Suspend/Resume Function, Hibernation, Standby		
SECURITY FEATURES	<ul style="list-style-type: none">Password Security: Supervisor, User, Hard Disk LockKensington cable lock slotTrusted platform module (TPM) security chip v2.0¹¹Computrace® theft protection agent in BIOS⁸Optional Insertable SmartCard reader^{2,7}Optional Contactless SmartCard/HF RFID reader²~ ISO 15693 and 14443 A/B compliant		

WARRANTY	
<ul style="list-style-type: none">3-year limited warranty, parts and labor	
DIMENSIONS & WEIGHT ⁹	
<ul style="list-style-type: none">10.6" (L) x 7.4" (W) x 0.8" (H)2.4 lbs. (standard battery)3.0 lbs. (optional long life battery)⁷	
INTEGRATED OPTIONS ¹⁰	
<ul style="list-style-type: none">4G LTE multi carrier mobile broadband with satellite GPSChoice of 1D/2D barcode reader (EA11 or EA21), GPS, Serial Dongle, Ethernet, MicroSDXC or second USB 2.0 port¹Choice of bridge battery, magstripe reader, insertable SmartCard reader, insertable SmartCard reader with bridge battery, contactless SmartCard/HF RFID reader or UHF 900MHz RFID reader (EPC Gen 2)¹²	
ACCESSORIES ¹⁰	
<ul style="list-style-type: none">AC Adapter (3-prong)Standard Battery PackLong Life Battery Pack⁷Long Life Battery Bundle (includes rotating hand strap and corner guard set)Single Battery Charger BundleLIND 3-Bay Battery ChargerLIND Car Adapter 120WLIND Car/AC Adapter 90W (with USB port)LIND Car Adapter 90W MIL-STDTall Corner Guard SetRotating Hand Strap and Tall Corner Guard Set BundleToughMate G1 Always-On Case (with hand strap)ToughMate G1 Professional PortfolioToughMate G1 "X" Hand StrapDesktop CradleVehicle Docks (no pass-through)~ Gamber-Johnson~ Havis with LIND power supplyVehicle Docks (dual pass-through)~ Gamber-Johnson~ Havis with LIND power supplyCradlepoint Router~ Verizon~ AT&TReplacement Digitizer Pen WaterproofTether10.1" LCD Protective Film	<ul style="list-style-type: none">CF-AA6413CMFZ-VZSU84ZUFZ-VZSU88UFZ-BNDL61LL1ST1CG4FZ-BNDL61BATCHR9FZ-LND3BAG1CF-LNDDC120CF-LNDACDC90CF-LNDMLDC90FZ-WCGG111FZ-BNDL61ST1CG4TBCG1AGNL-PTBCG1PFLIO-BLK-PTBCG1XSTP-PFZ-VEBG11AU7160-0486-00-PCF-H-PAN-702-P7160-0486-02-PCF-H-PAN-702-2-PCP-IBR1100LPE-VZCP-IBR1100LPE-ATFZ-VNPG11U-SFZ-VNTG11UFZ-VFPG11U

Please consult your reseller or Panasonic representative before purchasing.

Caution: Do not expose bare skin to this product when handling this unit in extreme hot or cold environments.

¹ Approximate time. Battery operation and recharge times will vary based on many factors, including screen brightness, applications, features, power management, battery conditioning and other customer preferences. Battery testing results from MobileMark 2007.

² Bridge battery, magstripe reader, insertable SmartCard reader, insertable SmartCard reader with bridge battery, contactless SmartCard reader and UHF RFID reader are mutually exclusive. Please note, USB 3.0 port cannot be accessed when the unit is equipped with the magstripe reader, but optional USB 2.0 port can be accessed.

³ GPS, Serial Dongle, Ethernet, MicroSDXC and second USB port are mutually exclusive options.

⁴ 1GB = 1,000,000,000 bytes.

⁵ Total usable memory will be less depending upon actual system configuration.

⁶ The size of the VRAM cannot be set by the user and varies by operating system as well as the size of the RAM. Windows 7 max, VRAM is 1555MB.

⁷ Magstripe reader, insertable SmartCard reader, insertable SmartCard reader with bridge battery and UHF RFID reader include tall corner guards and rotating hand strap. Bridge battery (without SmartCard reader) includes medium corner guards and rotating hand strap.

⁸ Requires software and activation to enable theft protection.

⁹ Length measurements do not include protrusions. Weight varies with options and digitizer pen.

¹⁰ Accessories and Integrated Options may vary depending on your configuration. Visit the Panasonic website for more accessories and details.

¹¹ Hazardous location certifications may not apply to all configurations. Consult your Panasonic representative for availability.

¹² TPM 1.2 available upon request - please contact your reseller or Panasonic representative.



1.800.662.3537
panasonic.com/toughpad/G1

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Canon
EOS 5D Mark IV

A Art 50mm F1.4 DG HSM



+ Design detail



Incredible resolution ideal for the high-megapixel era. Introducing the new benchmark large-aperture standard lens

In 2008, Sigma released a large diameter standard lens designed for digital SLRs, "SIGMA 50mm F1.4 EX DG HSM". At that time, products for film cameras were prevalent, yet we spent enormous effort to set a new benchmark for the 50mm lens that optimizes the characteristics of digital cameras, such as compensating peripheral brightness, controlling the point images in the corners, and improving the image drawing, not only around the focusing point, but also other areas in the image.

