TELEDYNE
PARADISE DATACOM
A Teledyne Technologies Company

QUANTUM Series
PD60S & PD60SL
Modem Redundancy Switch

OVERVIEW

The Quantum Modem Redundancy Switch system offers a revolutionary approach to Modem Redundancy Protection by integrating the Backup Modem and 1:N Redundancy Controller into a single unit. The Backup Modem / Controller becomes a 3RU high 19 inch chassis, which incorporates the traffic and overhead interface connectors necessary to support the online Modem group. This low cost and compact 1:N scheme employs proven integrated 1:1 Redundancy technology pioneered by Paradise Datacom.

EASE OF OPERATION

An innovative new menu structure makes configuration a simple procedure. Advanced user interfaces support the display of text in different languages. Unique Web User Interface offers full remote control and in-depth performance analysis tools using Internet Explorer without special Monitor & control software.

FEATURES

- Modular design gives maximum flexibility
- Integrated Backup Modem and Redundancy Controller in 3RU
- Low Cost
- Scaleable up to 1 for 16 (Traffic protection only)
- Scaleable up to 1 for 8 (Traffic and Overhead protection)
- Backup Modem / Controller can be replaced without affecting traffic
- Supports priority traffic channel protection
- Supports mixed traffic interfaces including Ethernet
- Supports Manual and Automatic Redundancy Protection
- Redundant power supplies for maximum reliability
- Web User Interfaces Remote Control via Ethernet - simple to configure
- PD60S Supports an IF Modem group with PD20 and/or PD60 Modems and optional Transponder Switching
- PD60SL supports an L-band Modem group with PD20L and/or PD60L Modems

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QUANTUM Series

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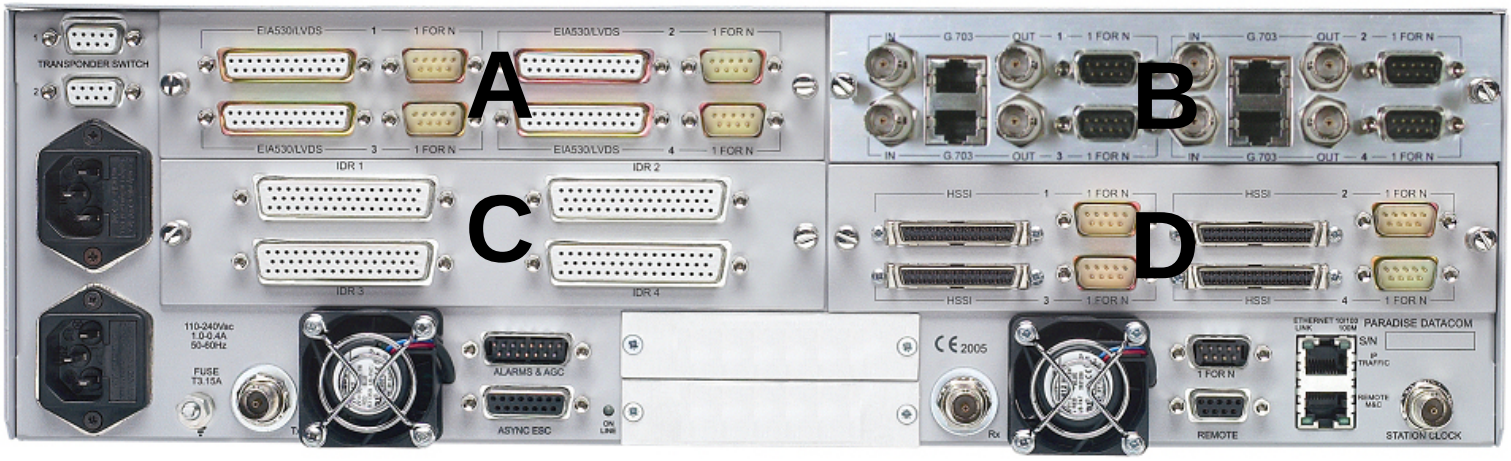
Instructions for selection of your Quantum Modem Redundancy Switch Options:

1 Select the Redundancy Switch interface options for interface positions A, B, C & D in accordance with the traffic interfaces used on the associated Traffic Modems, and overhead protection if required. Each Switch interface panel caters for up to 4 Modems with like physical interfaces.

2 Select whether the system is to be IF (PD60S) or L-band (PD60SL).

3 Select the features needed within the Backup Modem, ensuring that the Backup Modem includes all the features of every Traffic Modem within the Redundancy Group.

Rear view of PD60S IF Redundancy Switch



Please select your Backup Interface Options to include all modem interfaces within the group.

Interface Position A **hardware option**	Select 1 Option	SELECT YOUR OPTIONS HERE	4 x LVDS / EIA530 on D25 female supports serial LVDS, RS422, X.21, V.35
			4 x G.703 on BNC and RJ45 supports G.703 unbalanced and balanced
			4 x HSSI on HD50 50-way SCSI-2 connector
			4 x Ethernet on RJ45 supports 10/100BaseT Ethernet
Interface Position B **hardware option**	Select 1 Option		4 x LVDS / EIA530 on D25 female supports serial LVDS, RS422, X.21, V.35
			4 x G.703 on BNC and RJ45 supports G.703 unbalanced and balanced
			4 x HSSI on HD50 50-way SCSI-2 connector
			4 x Ethernet on RJ45 supports 10/100BaseT Ethernet
			Blanking Plate (position not used)
Interface Position C **hardware option**	Select 1 Option		4 x LVDS / EIA530 on D25 female supports serial LVDS, RS422, X.21, V.35
			4 x G.703 on BNC and RJ45 supports G.703 unbalanced and balanced
			4 x HSSI on HD50 50-way SCSI-2 connector
			4 x Ethernet on RJ45 supports 10/100BaseT
			4 x overhead protection for Modems connected to Interface Position A
			Blanking Plate (position not used)
Interface Position D **hardware option**	Select 1 Option		4 x LVDS / EIA530 on D25 female supports serial LVDS, RS422, X.21, V.35
			4 x G.703 on BNC and RJ45 supports G.703 unbalanced and balanced
			4 x HSSI on HD50 50-way SCSI-2 connector
			4 x Ethernet on RJ45 supports 10/100BaseT Ethernet
			4 x overhead protection for Modems connected to Interface Position B
			Blanking Plate (position not used)

QUANTUM Series

PD60S & PD60SL Modem Redundancy Switch

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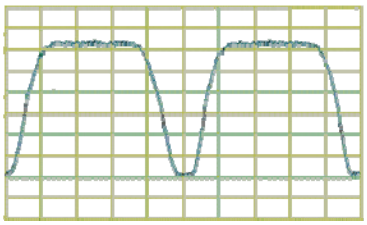
Fully configurable - only pay for what you need!

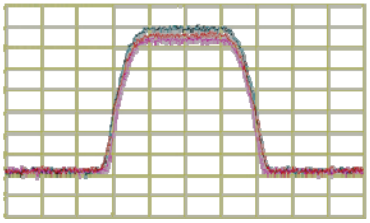
	Possible modes		
	SCPC	DVB-S2	**Description**
PD60 Base Switch	•	•	BPSK/QPSK/OQPSK, 4.8kbps to 10Mbps, 1bps variable rate, closed network modem. Ethernet 10/100BaseT on RJ45 for M&C, unaccelerated Ethernet 10/100BaseT on RJ45 via traffic or overhead (Ethernet Bridging) Includes: Viterbi FEC, Rates 1/2, 3/4 & 7/8 with k=7. Intelsat Reed-Solomon Outer Codec to IESS 308 Advanced ESC: Variable rate Async channel for Closed Net plus ESC operation. AUPC: Automatic Uplink Power Control (operates through ESC channel) Remote Web Browser based monitoring tools (Spectrum Display, Constellation Monitor and link performance versus time) plus SMTP email client for status notification. DHCP allowing IP address to be allocated dynamically via external DHCP network server Ethernet header compression of data rates up to 2Mbps IEEE 802.1p QoS supporting choice of strict priority queuing or fair weighting queuing, IEEE 802.1q VLAN support.
		•	50kbps to 10Mbps, 1bps variable rate in DVB-S2 mode, requires a DVB-S2 option
Either IF PD60S	•	•	IF Frequency 50-90 MHz & 100-180MHz in 100Hz steps, Closed Network modem, Closed Network plus ESC modem. **(hardware option)**
or L-band PD60SL	•	•	L-band: 950- 1950MHz with 100Hz resolution, includes 4E-8 internal reference **(hardware option)**
Adds Data Rates to 16,896kbps	•	•	Extends base operation to 16,896kbps
Adds Data Rates to 25Mbps	•	•	Extends 16,896kbps operation to 25Mbps - requires 16,896kbps option
Adds Data Rates to 60Mbps	•	•	Extends 25Mbps operation to 60Mbps - requires 16,896kbps & 25Mbps options
Wideband L-band	•	•	Extends L-band coverage to 950-2050MHz in 100Hz steps
Dynamic Routing	•	•	Adds Dynamic Routing, supports RIP, OSPF and BGP, plus 64 static routes. Can be used with the base IP Traffic interface or IP traffic card.
TCP Acceleration	•		Point-to-Point and Point-to-Multipoint TCP/IP Acceleration to 10Mbps on base Ethernet port, subject to prevailing data rate limits - overcomes performance problems associated with TCP over satellite
Ethernet Brouting	•	•	Ethernet Brouting for Point-to-Multipoint operation when there is a non-satellite return path - can be used with base Ethernet port or IP Traffic card
IP Traffic Shaping	•	•	Supports allocation of CIR and BIR plus priority for IP Streams identified by IP Address, Diffserv Class, IEEE 802.1p priority tag or MPLS EXP field. Can be used with the base IP Traffic Interface or the IP Traffic card.
Position 1 (must choose 1 option) **hardware option**	•	•	EIA 530 D25 DCE providing selectable RS422 / X.21 / V.35 / RS232, also balanced G.703 if G.703 option fitted
	•	•	IDR operation to IESS 308. Two audio ESC channels, synchronous 8kbps ESC, four from 'C' backward alarms & Async access to 8k sync channel - includes EZ Audio test tone generator
	•	•	Sat-Abis Interface card (DOUBLE HEIGHT CARD - negates fitting any option in position 2) One E1/fractional E1 port on RJ45 enabled - maximum aggregate traffic rate 2048kbps in all cases
	•	•	Blank Panel
Position 1 Sat-Abis card options - can only be used with the Sat-Abis Interface card	•	•	Adds Port 2, E1/fractional E1 on RJ45, requires Sat-Abis Interface in position 1
	•	•	Adds Port 3, E1/fractional E1 on RJ45, requires Sat-Abis Interface in position 1 plus Port 2 activated
	•	•	Adds Port 4, E1/fractional E1 on RJ45, requires Sat-Abis Interface in position 1 plus Ports 2 and 3 activated
Position 2 (must choose 1 option) **hardware option**	•	•	Serial LVDS on D25
	•	•	EIA 530 D25 DCE providing selectable RS422/X.21/V.35/RS232, also balanced G.703 if G.703 option fitted
	•	•	HSSI on HD50 50-way SCSI-2 connector
	•	•	IP Traffic card providing TCP acceleration to 16,896kbps (P-P and P-MP), subject to prevailing data rate limits, also provides HTTP Acceleration by prefetching webpage inline objects to reduce webpage download time - requires either Blank Panel or EIA 530 in position 1
	•	•	Eurocom D1 on D25 male - pin compatible with P300 Eurocom
	•	•	Eurocom D1 / EIA530 on D25 female
	•	•	Quad E1 Multiplexer with 1 x RJ45 port enabled plus integral G.703 and Drop & Insert included - includes IBS/SMS satellite framing
	•	•	Blank Panel
Position 2 Quad E1 Mux options - only used with Quad E1 Mux card	•	•	Adds Port 2 with Drop & Insert to Quad E1 card - requires Quad E1 Mux plus data rate option to 5Mbps
	•	•	Adds Port 3 with Drop & Insert to Quad E1 card - requires Quad E1 Mux with Port 2 option plus 5Mbps and 10Mbps data rate options
	•	•	Adds Port 4 with Drop & Insert to Quad E1 card - requires Quad E1 Mux with Port 2 option & Port 3 option plus 5Mbps and 10Mbps data rate options
	•	•	MultiMux - Allows base IP traffic and/or EIA 530 traffic, if EIA 530 interface fitted, to be used in place of 1 or 2 x Quad E1 ports. Each MultiMux port limited to 2,048kbps traffic rate.
Position 2 IP Traffic card options	•	•	Adds TCP acceleration up to 25Mbps on IP Traffic card, subject to prevailing data rate limits - requires IP Traffic card
	•	•	Adds TCP acceleration up to 60Mbps on IP Traffic card, subject to prevailing data rate limits - requires IP Traffic card and requires 25Mbps Acceleration option
	•	•	Adds Robust Header Compression to RFC 3059 (IP/UDP) at throughput rates to 29kpkts/s (1-way), 22kpkts/s (2-way), subject to prevailing data rate limits - requires IP Traffic card
		•	Encapsulation of IP packets and Ethernet frames over DVB uses Paradise eXtreme Protocol (PXE), Multi Protocol Encapsulation (MPE) or Ultra Lightweight Encapsulation (ULE) protocols, includes Static Routing - up to 64 static routes
Position 3 (only for G.703 traffic) **hardware option**	•	•	No BNC traffic interface - if no G.703 option
	•	•	2 x BNC sockets providing unbalanced G.703 75 ohm - supplied only with G.703 optio
DVB-S2 Modulation & Coding **hardware options**		•	DVB-S2 CCM Tx - includes QPSK, 8PSK & 16APSK for DVB-S2 use only, includes also LDPC-BCH Error Correction for DVB-S2 only. Must specify IP Traffic card if IP Traffic required.
		•	DVB-S2 CCM Rx - includes QPSK, 8PSK & 16APSK for DVB-S2 use only, includes also LDPC-BCH Error Correction for DVB-S2 only. Must specify IP Traffic card if IP Traffic required. **Includes DVB-S2 ACM Receive function - when used, requires the other end of the link to have DVB-S2 ACM Transmit.**
DVB-S2 VCM Multistreaming		•	VCM point-to-multipoint multistreaming allows the FEC rate and modulation to be selected for individual remotes
DVB-S2 ACM Transmit Automatic Coding and Modulation - requires DVB-S2 CCM Tx **When used, requires the other end of the link to have DVB-S2 CCM RX including DVB-S2 ACM Receive.**		•	DVB-S2 ACM Transmit to 2Mbps
		•	DVB-S2 ACM Transmit extension to 5Mbps, requires DVB-S2 Transmit to 2Mbps
		•	DVB-S2 ACM Transmit extension to 10Mbps, requires DVB-S2 Transmit to 2Mbps & 5Mbps
		•	DVB-S2 ACM Transmit extension to 20Mbps, requires DVB-S2 Transmit to 2Mbps & 5Mbps & 10Mbps, subject to prevailing data rate limits
		•	DVB-S2 ACM Transmit extension to 60Mbps, requires DVB-S2 Transmit to 2Mbps & 5Mbps & 10Mbps & 20Mbps & 60Mbps, subject to prevailing data rate limits
Low Rate TPC 2nd Generation Turbo *10Mbps maximum* *Subject to prevailing data rate limits*	•		Rates 5/16, 21/44, 0.493, 2/3, 3/4, 0.789, 7/8 Paradise (low latency) in BPSK, QPSK, OQPSK Rate 7/8 in QPSK, OQPSK Rate 0.93 Paradise in QPSK, OQPSK Rates 3/4, 7/8, 0.93 Paradise in 8PSK - requires 8PSK option Rates 3/4, 7/8, 0.93 Paradise in 16QAM - requires 16QAM option
High Rate TPC 2nd Generation Turbo *Extension to 60Mbps, requires Low Rate TPC* *Subject to prevailing data rate limits*	•		Rates 5/16, 21/44, 0.493, 2/3, 3/4, 0.789, 7/8 Paradise (low latency) in BPSK, QPSK, OQPSK Rate 7/8 in QPSK, OQPSK Rate 0.93 Paradise in QPSK, OQPSK Rates 3/4, 7/8, 0.93 Paradise in 8PSK - requires 8PSK option Rates 3/4, 7/8, 0.93 Paradise in 16QAM - requires 16QAM option
Sequential FEC Limited to 2,048kbps *maximum*	•		Rates 1/2, 3/4, 7/8 in BPSK, QPSK, OQPSK
FastLink Low Latency LDPC subject to prevailing data rate limits	•		FastLink LDPC ready **(hardware option)** - requires additional FastLink LDPC software features below
	•		FastLink LDPC up to 1Mbps, supports BPSK and QPSK, also supports 8PSK - requires 8PSK option, Fastlink 8QAM - requires Fastlink 8QAM option, FastLink 16APSK - requires FastLink 16APSK option, FastLink 32APSK - requires FastLink 32APSK option, FastLink 64QAM - requires FastLink 64QAM option, and 16QAM - requires 16QAM option. **Must have FastLink LDPC ready option.**
	•		FastLink LDPC extension to 2.5Mbps - requires FastLink LDPC to 1Mbps
	•		FastLink LDPC extension to 5Mbps - requires FastLink LDPC to 1Mbps and extension to 2.5Mbps
	•		FastLink LDPC extension to 10Mbps - requires FastLink LDPC to 1Mbps plus extension to 2.5Mbps and extension to 5Mbps
	•		FastLink LDPC extension to 25Mbps - requires FastLink LDPC to 1Mbps plus extension to 2.5Mbps, extension to 5Mbps and extension to 10Mbps
	•		FastLink LDPC extension to 60Mbps - requires FastLink LDPC to 1Mbps plus extension to 2.5Mbps, extension to 5Mbps, extension to 10Mbps and extension to 25Mbps

Configuration options continue on next page.

Paired Carrier Operation

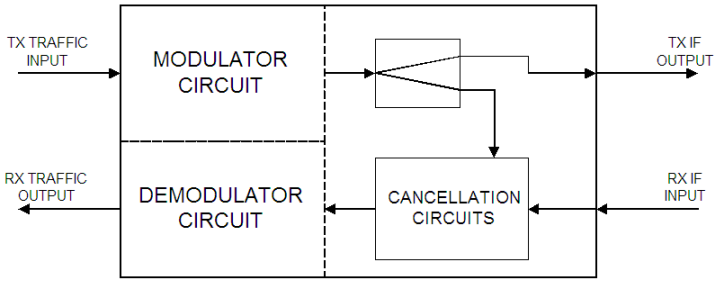


Paired Carrier Disabled



Paired Carrier Enabled
Can save 50% on space segment

PAIRED CARRIER MODEM SCHEMATIC



Paired Carrier technology allows both the uplink and downlink signals to occupy the same space segment. An adaptive self-interference cancellation technique removes the uplink signal components generated by the local terminal from the received signal off satellite, allowing demodulation of the far end signal.

Paired Carrier	
Parameter	**QUANTUM Series Switch**
Paired Carrier	Transmit and receive carriers are overlaid on top of each other in the same space segment. Echo cancellation techniques are used in the demodulator to cancel the transmit carrier and extract the wanted receive carrier signal.
Paired Carrier data rate options	512kbps, 1024kbps, 2.5Mbps, 5Mbps, 10Mbps, 15Mbps, 20Mbps, 25Mbps, 40Mbps, 50Mbps and 60Mbps traffic rate

Fully configurable - only pay for what you need!

	Possible modes		
	SCPC	DVB-S2	**Description**
FastLink 8QAM	●		FastLink 8QAM requires FastLink LDPC
FastLink 16APSK	●		FastLink 16APSK - requires FastLink LDPC
FastLink 32APSK	●		FastLink 32APSK - requires FastLink LDPC
FastLink 64QAM	●		FastLink 64QAM - requires FastLink LDPC
8PSK Including TCM	●		Rate 2/3 8PSK Pragmatic TCM to IESS 310 **supports 8PSK Turbo - requires 2nd Generation Turbo FEC** **supports FastLink 8PSK - requires FastLink LDPC**
16QAM	●		16QAM - requires either 2nd Generation Turbo FEC option or LDPC option
IBS / SMS	●	●	Satellite Framing to IESS 309 with low rate Intelsat ESC (to IESS 403) & High Rate IBS/SMS ESC
Audio Channels	●	●	P1348 Emulation mode for IBS 64kbps carrier (2xaudio) or 128kbps (2xaudio + 64kbps data) - requires IBS / SMS & IDR options
G.703	●	●	E1, T1, E2, T2, E3, T3 interfaces **(hardware option)** - requires either EIA 530 or BNC sockets for traffic
Drop / Insert including Extended D/I	●	●	T1/E1 linear order Drop/Insert. Drop/Insert can operate with any interface, although G.703 is typically used (requires G.703 option if used in G.703 mode). Independent timeslot re-ordering on Tx & Rx. Signalling (E1 CAS & T1 RBS). Rx Partial Insert for multi-destinational working. Timeslot ID maintenance for N=1 to 31 with IBS/SMS or Closed Net plus ESC.
G.703 Clock Extension	●	●	Provides a stable G.703 E1 or T1 reference clock over satellite when traffic is NOT E1 or T1
Advanced AUX	●	●	Variable rate synchronous Aux channel for IBS / SMS - requires IBS / SMS option IDR 32/64kbps in place of one/both audio ADPCM ESC channels - requires IDR option
Custom	●	●	Custom RS Outer Codec values of n, k and interleaver depth. Custom IBS / SMS modes, allocation of overhead between ESC and Aux channels in IBS / SMS, custom backward alarms in IBS / SMS, and Closed Net plus ESC - requires IBS/SMS option. Custom IDR mode - requires IDR option.
EZ BERT - PRBS Tester	●	●	Internal Bit Error Rate Tester (BERT) can run through main data channel, or ESC/Aux channels, or output/input via the terrestrial interface
OM-73	●		OM-73 Scrambling, symbol mapping and Viterbi compatibility
24V 100W BUC PSU	●	●	P3532 AC Input, 24V 100W DC to Tx BUC (hardware option)
48V 100W BUC PSU	●	●	P3531 AC Input, 48V 100W DC to Tx BUC (hardware option)
24V 180W BUC PSU	●	●	P3536 AC Input, 24V 180W DC to Tx BUC (hardware option)
48V 180W BUC PSU	●	●	P3535 AC Input, 48V 180W DC to Tx BUC (hardware option)
48V DC Input	●	●	K3002 48V DC Primary power supply input in place of 100-240V AC (hardware option)
48V in & 24V BUC PSU	●	●	K3002 + P3538: Floating 48V DC input, 24V 180W DC to Tx BUC (hardware option)
48V in & 48V BUC PSU	●	●	K3002 + P3537: Floating 48V DC input, 48V 180W DC to Tx BUC (hardware option)
+48V in & 48V BUC PSU	●	●	K3002 + P3539: +48V DC input, +48V 180W DC to Tx BUC (hardware option)
FSK Control	●	●	Controls and monitors single-box Paradise BUCs from the Modem (hardware option)
Adaptive Signal Predistorter	●		Use with 16QAM to relax HPA backoff by up to 1.6dB. Compensates for HPA non-linearities in ground segment and/or transponder. Requires 16QAM option.
Tx Only operation	●	●	Transmit functions only
Rx Only operation	●	●	Receive functions only
Paired Carrier (carrier re-use) subject to prevailing modem data rate limits. Minimum occupied band-width limit of 150kHz, and maximum occupied bandwidth limit of 36MHz	●	●	P3603 - Paired Carrier Ready, allows carriers to be overlapped thereby reducing the required satellite bandwidth. **(hardware option)** - requires additional cumulative software options below depending upon data rate required
	●	●	Paired Carrier up to 512kbps traffic rate - requires Paired Carrier Ready option
	●	●	Extends Paired Carrier up to 1024kbps traffic rate - requires 512kbps option
	●	●	Extends Paired Carrier up to 2.5Mbps traffic rate - requires 1024kbps option
	●	●	Extends Paired Carrier up to 5Mbps traffic rate - requires 2.5Mbps option
	●	●	Extends Paired Carrier up to 10Mbps traffic rate - requires 5Mbps option
	●	●	Extends Paired Carrier up to 15Mbps traffic rate - requires 10Mbps option
	●	●	Extends Paired Carrier up to 20Mbps traffic rate - requires 15Mbps option
	●	●	Extends Paired Carrier up to 25Mbps traffic rate - requires 20Mbps option
	●	●	Extends Paired Carrier up to 40Mbps traffic rate - requires 25Mbps option
	●	●	Extends Paired Carrier up to 50Mbps traffic rate - requires 40Mbps option
	●	●	Extends Paired Carrier up to 60Mbps traffic rate - requires 50Mbps option
Ruggedisation	●	●	Adds extra ruggedisation for hostile environments