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* Pioneer Server Operating System
* Version history
*
* 4.8
*   fixed compass readings quadrant 3
*   added COM_KICK command
*   added COMsetv, COMsetrv commands
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* 4.7
*   added support for compass on serial I/O
*   shows compass reading on LCD
*   fixed COM_PSU for non-multiplexed RC servos (no
*     experimenter board).
*   added KICK (one-shot) command
*
* 4.6
*   changed connect message to show headcount for rotation
*   added support for Sony camera with RS232 multiplexing
*   put class/subclass names into EEPROM; names are pionlm,
*     pionlx, pionat
*
*
* 4.5
*   tracked down pesky servo glitch
*   added support for 5 servos on exp board
*   changed COM_PSU to take 2 byte args: servo # and 10us time
*
* 4.4
*   changed to true PID control
*   put motion parameters in EEPROM, configurable
*   added extra encoder count tables for Pioneer AT
*   10 KHz encoder poll
*
* 4.3
*   added DCHEAD command
*   PSU cycle steady
*   read params from EEPROM
*   experimenters board flag
*
* 4.2
*   changed COM_digout to take a mask as first byte
*   changed pac_string max to 40 chars
*   added COMsay
*   added gripper and speaker functionality
*   added comHEAD command for absolute angle positioning
*   added comRVEL command for rotational velocity, units ~ang/sec
*
* 4.1
*   added support for new Pittman motors, using psos-4.1m-conf
*   changed angular units to 0-4095, using single sin table
*   changed config info to last sync return
*   added support for flash PROM
*   fixed bug in DHEAD command
*   added support for independent wheel velocity control
*
* 4.0
*   added testing of digital/analog I/O
*   added config packets
*   added nose and general I/O functions and commands
*   added user A/D output and command
*
* 3.9
*   added string args in commands
*   added sonar polling command
*
* 3.8
*   added PSU (position servo unit) support on OC3
*   added stall info return in bumpers bytes
*   added ORIGINCOM
*   put buzzer into encoder interrupt, encoder on OC4
*
* 3.7
*   sonar polling doesnt call sonar 7

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* faster VELCOM speeds

PSOS client-command communication packet

Component	Bytes	Value	Description
Header	2	0xFA, 0xFB	Packet header; same for client and server
Byte Count	1	N + 2	Number of command bytes plus checksum; must be < 200 total bytes long
Command Number	1	0 - 255	Client command number; see Table 4-4
Arg Type (optional)	1	0x3B or 0x1B or 0x2B	Data type of command argument, if included: (<i>sfARGINT</i>) positive integer (<i>sfARGNINT</i>) negative int or absolute value (<i>sfARGSTR</i>) string, null-terminated
Argument (optional)	n	data	Command argument; integer or null-terminated string
Checksum	2	computed	Packet integrity checksum

Note that Byte Count includes 2-byte checksum, but not 2-byte header.

PSOS 4.8 Command Set

Command	#	Arguments	Description	Version Implemented
SYNC0	0	none	Start connection; PSOS echoes these synchronization commands back to client.	3.x
SYNC1	1	none		
SYNC2	2	none		
PULSE	0	none	Communication pulse	3.x
OPEN	1	none	Open the motor controller	3.x
CLOSE	2	none	Close server and client connection	3.x
POLLING	3	string	Sets sonar polling sequence	3.9
SETV	6	pos integer mm/sec	Sets velocity for Colbert move command	4.8
SETO	7	none	Set server origin	3.x
SETRV	10	pos integer deg/sec	Sets rotational velocity for Colbert turn and turnto commands	4.8
VEL	11	signed int mm/sec	Forward (+) or reverse (-) velocity	3.x
HEAD	12	unsigned int degrees	Turn to absolute heading 0-359 degrees	4.2
DHEAD	13	signed int degrees	Turn heading +-255 degrees	3.x
SAY	15	string, int	Up to 20 pairs of duration (20 ms increments) /tone (half-cycle) pairs; int is number of string bytes	
RVEL	21	signed int degrees/sec	Set rotational velocity +- 255 degrees/sec	4.2
DIGOUT	30	integer	Msb mask selects output port(s) OD0-7; lsb pattern sets/unsets those selected ports	4.2
DIGOUT*	30	integer bits 0-7	Sets/resets digital output bits	4.0
TIMER	31	integer pin 0-7	Initiate user input timer, triggering an event with specified PIN	
VEL2	32	int 4*mm/sec	Independent wheel velocity; lsb=right wheel; msb=left wheel; +-4mm/sec increments	4.1
GRIPPER	33	integer 0, 1, 4, 5	Sets Gripper state	4.2
KICK	34	integer ms	Trigger digital output port OD0 for ms milliseconds (one-shot).	4.8
PTUPOS	41	Integer msb=0-4; lsb=1- 2000µs	Set pulse-width for position servo control; lsb is pulse width in 100µs units; msb addresses mux'd RC0-4 on Experimenter's Module.	4.5
PTUPOS**	41	integer 1-2000µs	Set pulse-width for position servo control.	4.0
STEP	64	none	Single-step mode (simulator only)	3.x

PSOS server information data packet (minimum contents)

Name	Data Type	Description
Header	int	Exactly 0xFA, 0xFB
Byte Count	byte	Number of data bytes + 2; must be less than 201 (0xC9)
Status	byte = 0x3S; where S =	Motors status
	<i>sfSTATUSNOPOWER</i>	Motors power off
	<i>sfSTATUSSTOPPED</i>	Motors stopped
	<i>sfSTATUSMOVING</i>	Robot moving
Xpos	unsigned int (15 ls-bits)	Wheel-encoder integrated coordinates; platform-dependent units—multiply by DistConvFactor in the parameter file to convert to mm; roll-over ~ 3 m
Ypos	unsigned int (15 ls-bits)	
Th pos	signed int	Orientation in platform-dependent units—multiply by AngleConvFactor for degrees.
L vel	signed int	Wheel velocities (respective Left and Right) in platform-dependent units—multiply by VelConvFactor to convert to mm/sec.
R vel	signed int	
Battery	byte	Battery charge in tenths of volts
Bumpers	2 bytes - L and R	Motor stall indicators
Control	signed int	Setpoint of the server's angular position servo—multiply by AngleConvFactor for degrees
PTU	unsigned int	Pulse width of position servo
Compass	byte; 0-179	Compass heading in 2-degree units
Sonar readings	byte	Number of new sonar readings included in information packet; readings follow:
Sonar num	byte	Sonar number
Sonar range	unsigned int	Sonar reading—multiply by RangeConvFactor for mm
<i>... rest of the sonar readings ...</i>		
Input timer	unsigned int	User input timer reading
User Analog	byte	User analog input reading
User Input	byte	User digital input pins
User Output	byte	User digital output pins
Checksum	int	Checksum (see previous section)

Note that Byte Count includes 2-byte checksum, but not 2-byte header.