

V: Registers

Each robot has a number of registers or variables. They are initialized to their appropriate values, or 0 if none is appropriate, when the battle starts. This section lists each variable, its use, and whether it can be read or written. The registers are:

A-Z	AIM	BOTTOM	BULLET	CHANNEL
CHRONON	COLLISION	DAMAGE	DOPPLER	ENERGY
FIRE	FRIEND	HISTORY	HELLBORE	ID
KILLS	LEFT	LOOK	MINE	MISSILE
MOVEX				
MOVEY	NUKE	PROBE	RADAR	
RANDOM	RANGE			
RIGHT	ROBOTS	SCAN		
SHIELD	SIGNAL	SPEEDX	SPEEDY	STUNNER
TEAMMATES	TOP	WALL	X	Y

A-Z (except X and Y)

User-defined variables. They may be used for any temporary storage that the robot needs. They may be read or written.

AIM

Angle turret points. May be read or written. The angle is in degrees, oriented like a compass with 0 degrees pointing upward and 90 degrees pointing to the right. All bullets and missiles are fired in the direction that the turret is pointing.

BULLET

Fires a normal bullet if either normal or explosive bullets are enabled. This is primarily useful so that robots equipped with explosive bullets can fire at short range without engulfing themselves in the explosion. Returns 0 if read.

BOTTOM / BOT

This register is used exclusively for interrupts. It has no effect if written and returns 0 if read.

CHANNEL

The robot's broadcasting and receiving channel. May be read5ten. If it is read, it returns the current channel. If it is written, it sets the channel. The channel must be in a range of 1 to 10. Communications over a given channel only affect robots on the same team. Thus, a robot must be placed on a team with at least one other robot at Camp if communications are to have any effect.

CHRONON

Returns the number of chronons elapsed in the current battle. CHRONON may only be read.

COLLISION

May only be read. If another robot has collided with the current robot, the COLLISION variable returns 1; otherwise it returns 0. When a collision with another robot takes place, both robots take one point of damage each chronon until they separate. They may either separate by changing direction, or by blowing the rival to little pieces.

DAMAGE

Robot's current damage rating. May only be read. When the battle begins, the damage rating starts at the maximum value set at the Hardware Store. Damage caused by bullets, missiles, and TacNukes that is not absorbed by the robot's shields is removed from the damage rating. When it reaches 0, the robot is dead.

DOPPLER

This register is used to help tracking routines. It is used in conjunction with the RANGE command. If no target is in the robot's sights, (i.e. the RANGE register is 0), DOPPLER returns 0. Otherwise, it

returns the speed of the target in a direction perpendicular to the aim. For instance, if the target is moving directly toward or away from the robot, DOPPLER will return 0. If the robot's sights are pointing directly up and the target is moving from left to right at speed 8, the DOPPLER register will contain 8. DOPPLER has no effect if written. (Note: the DOPPLER command existed in some earlier versions of RoboWar, but was somewhat buggy and had not been documented.)

ENERGY

Robot's current energy. May be read, but not written. ENERGY returns the amount of energy the robot currently has. If not used for other purposes, energy is restored at 2 points per chronon. However, if the energy ever drops below 0, the robot does not interpret any more instructions or perform any more actions until the energy exceeds 0 again. When the battle begins energy is set to the maximum energy value specified in the Hardware Store.

FIRE

Used to shoot bullets. Returns 0 if read, shoots bullet with energy investment equal to amount written. This energy investment is removed from the robot's energy supply. It may exceed the robot's current energy value (placing the robot at negative energy and immobilizing it), but may not exceed the robot's energy maximum. Depending on the settings from the Hardware Store, bullets may be normal, rubber, or explosive. Explosive bullets explode like TacNukes in a 36 pixel radius when they hit their target. When they detonate (3 chronons after impact) they do damage of 1.5*energy investment to all robots in the blast radius. This is a larger, faster explosion than in versions of RoboWar before 3.0. Normal bullets do damage equal to the energy investment when they hit their targets. Rubber bullets only do half damage if they hit. Bullets move across the screen at a speed of 12 pixels per chronon, heading in the direction that the robot's turret pointed when the shot was fired.

FRIEND

Is the robot sensed in a collision on your team? FRIEND can only be read. If the collision register holds a 1, the FRIEND register holds a 1 if the robot collided with is on the same team. Otherwise, the FRIEND register holds a 0. This is useful to determine if a collision has taken place with another robot on your same team.

HISTORY

Maintains a history of results and observations between battles. Each robot has 50 history registers. The history register to read or write is selected with the setparam command (e.g. 2 HISTORY' SETPARAM). The history registers are:

- 1) Number of battles fought
- 2) Kills made in previous battle
- 3) Kills made in all battles
- 4) Survival points in previous battle
- 5) Survival points from all battles
- 6) 1 if last battle timed out
- 7) Teammates alive at end of last battle (excluding self)
- 8) Teammates alive at end of all battle
- 9) Damage at end of last battle (0 if dead)
- 10) Chronons elapsed at end of last battle
- 11) Chronons elapsed in all previous battles
- 12-30) Reserved for future RoboWar versions
- 31-50) User-defined.

When no battles have been fought yet, numbers default to zero. User-defined history registers may be read or written and are preserved between rounds so robots can learn from the results of previous rounds. All other history registers may only be read. Suggestions for new history registers are welcome. History is zeroed anytime robots are added or deleted in the arena (or between rounds in tournaments). It may also be erased or viewed with the history commands under the Arena menu.

Warning: in very long tournaments, it is conceivable that the history register could overflow 32767, the maximum integer in RoboWar. This is especially true for register 11. Hacker beware!

HELLBORE

Used to launch hellbores. Returns 0 if read, shoots hellbore with speed equal to amount written (this

is different than hellbores in RoboWar 2.1.2). This amount is removed from the robot's energy supply. Hellbores reduce the shield of any robot they hit to zero but do no other damage. They must move at a speed from 4 to 20 in the direction that the robot's turret pointed when the shot was fired. Hellbores cannot be used unless they were first enabled at the hardware store.

ID

Robot's unique ID number. Each robot in the Arena has an ID from 0-5; it can be used to tell robots apart.

KILLS

The number of kills the robot has made in this battle. A robot gets no credit for killing itself or for crushing other robots during a collision.

LEFT

This register is used exclusively for interrupts. It has no effect if written and returns 0 if read.

LOOK

Targeting offset from AIM. The RANGE command returns a distance to the nearest robot in the direction AIM+LOOK. This might theoretically be useful for some tracking algorithm, but in practice is seldom useful. If not otherwise set, LOOK defaults to 0. LOOK may be read or written.

MINE

Used to lay atomic land mines. Returns 0 if read, places a mine with energy investment equal to the amount written. The mine is stationary and becomes active ten chronons after placement. Once active, it will detonate against any target that hits it, causing damage equal to $2 * (\text{energy investment} - 5)$. This is twice as effective as mines in RoboWar 2.3 and earlier. Mines cannot be used unless they were first enabled at the hardware store.

MISSILE

Used to shoot missiles. Returns 0 if read, shoots missile with energy investment equal to amount written. This energy investment is removed from the robot's energy supply. It may not exceed the robot's energy max; if it does, only EnergyMax energy is used (this is changed; prior to RoboWar 4.1.2, a maximum of 50 points could be used). Missiles do $2 * \text{energy investment}$ in damage if they hit their targets. Missiles move across the screen at a speed of 5 pixels per chronon, heading in the direction that the robot's turret pointed when the shot was fired. Missiles cannot be used unless they were first enabled at the hardware store.

MOVEX

Used to move the robot a given distance in the X direction without changing SPEEDX. Returns 0 if read, moves the robot the specified distance if written. Movement costs two points of energy per unit moved. The distance must be between -20 and 20 units.

MOVEY

Used to move the robot a given distance in the Y direction without changing SPEEDY. MOVEY has the same characteristics and restrictions as MOVEX.

NUKE

Used to place TacNukes, or Tactical Nuclear Devices. Returns 0 if read, places TacNuke with energy investment equal to amount written. This energy investment is removed from the robot's energy supply. It may exceed the robot's current energy value (placing the robot at negative energy and immobilizing it), but may not exceed the robot's energy maximum. TacNukes begin to explode as soon as they are placed, increasing in radius by 5 pixels each chronon. At the tenth chronon, when they have a radius of 50, they detonate and cause $1.5 * \text{energy investment}$ in damage to all robots in the radius. Robots who lay TacNukes are well advised to hasten away and be out of the blast radius when the devices explode. TacNukes cannot be used unless they were first enabled at the hardware store.

PROBE

Long range probe of opponent's systems. Returns information about the target in the direction of the

AIM register when read; no effect if written. The register to probe is chosen with the SETPARAM command (e.g. SHIELD' PROBE' SETPARAM to select the SHIELD register for probing); it may be one of DAMAGE, ENERGY, SHIELD, ID, TEAMMATES, AIM, LOOK, SCAN. Probes must be enabled in the hardware store at the cost of one hardware point. PROBE defaults to probing the DAMAGE register if no other parameter has been set.

RADAR

Range to nearest bullet, missile, or TacNuke in the path of AIM. May only be read. RADAR checks a path 40 degrees wide centered on the AIM (actually AIM+SCAN, but SCAN defaults to 0). It returns the distance to the nearest bullet, missile, or TacNuke in this path. If there are none, it returns 0. Note that the weapon detected might be moving perpendicular to the aim, not toward the robot.

RANDOM

A random number from 0 to 359. May only be read.

RANGE

Range to nearest target in sights. May only be read. If there is a target in the direction the robot's AIM points, RANGE returns the distance. Actually checks in direction AIM+LOOK, but look defaults to 0. Otherwise, it returns 0.

RIGHT

This register is used exclusively for interrupts. It has no effect if written and returns 0 if read.

ROBOTS

Number of robots alive. Returns the number of robots alive in the arena, including the robot itself.

SCAN

Similar to LOOK, the radar offset from the AIM. The RADAR command searches for projectiles in the direction AIM+SCAN. This might be useful if a robot wants to look for targets in one direction, but check for danger in another direction. If not otherwise set, SCAN defaults to 0. SCAN may be read or written.

SHIELD

Robot's current shield level. May be read or written. If read, it returns the current level of the shield, or 0 if no shields are up. If written, it sets the shield level to the value written. If the current level is less than the level written, a point of energy is used for each point added to the shields. If not enough energy is available to set the shields, the shields are only strengthened as far as remaining energy permits. If the current level is greater than the level written, a point of energy is regained for each point of difference, although energy cannot exceed the maximum energy value set in the Hardware Store. Shields can absorb damage from bullets, missiles, or TacNukes that otherwise would have been deducted from a robot's damage score. Each point of damage that is done deducts one point from the shield level, until no power is left in the shields. The remaining damage is then done to a robot's damage score. Even if shields are not hit, they decrease by one half point each chronon from natural energy decay. Note that this replaces the old drain of one point per chronon in previous versions of RoboWar. Shields may be charged above the maximum shield value set in the Hardware Store (although they may never exceed 150), but if they are above maximum, they decrease by two points instead of one half per chronon. Shields are set to 0 when the battle begins.

SIGNAL

The signal value on the robot's current channel. May be read or written. If it is read, it returns the last value broadcast over the channel by any robot on the same team. If it is written, the value written is broadcast over the channel and may be read any time in the future by any other robot on the same team. Typically signals and channels are used by two or more robots to coordinate movement or team up against another set of robots.

SPEEDX

Speed of robot in left-right direction. May be read or written. Positive speeds move right, while negative speeds move to the left of the screen. If SPEEDX is read, it returns the current velocity; if it

is written, it sets the velocity. Speeds must be in the range of -20 to 20. Each point of change in speed costs 2 points of energy; thus going from 10 to -2 costs 24 energy.

SPEEDY

Speed of robot in up-down direction. May be read or written. Positive values move down, while negative values move up. SPEEDY has the same limits and characteristics as SPEEDX.

STUNNER

Used to fire a stasis capsule. Returns 0 if read, shoots stasis capsule with speed 14 in the direction that the robot's turret points. The amount written is removed from the robot's energy supply; if a stasis capsule hits a robot, the robot is placed in stasis for one chronon for every four points of energy invested in the capsule. While in stasis, a robot does not move, interpret instructions, or regain energy; however, the robot's shields do not decay. Stunners cannot be used unless they are first enabled in the Hardware Store.

TEAMMATES

Number of living teammates, not including self. May only be read.

TOP

This register is used exclusively for interrupts. It has no effect if written and returns 0 if read.

WALL

Is the robot touching the electrified walls? Returns 1 when read if the robot is touching the wall, or 0 otherwise. No effect if written.

X

X position of robot. May range from 0 to 300 (the boundaries of the board). 0 is the left side; 300 is the right. X may be read but may not be written (no unrestricted teleporting!).

Y

Y position of robot. May range from 0 to 300. 0 is the top; 300 is the bottom. Y may be read but not written.