

Data Dictionary for BrainMaster 2.5SE with Event Wizard		
11/1/2005		
Any of the following variables can be used at any time, in any BrainMaster session.		
	Any values computed using the equation processor can be used to display as trends, to produce sound feedback, to send control signals (inhibits, etc), or to be sent to the Macromedia Flash Player for BrainMaster	NOTE: ALL INFORMATION IN THIS SPECIFICATION ARE CONSIDERED IN DRAFT FORM. PLEASE CONTACT BRAINMASTER TECHNOLOGIES, INC. IF YOU HAVE QUESTIONS REGARDING THE USE OF THESE VARIABLES OR FUNCTIONS
Standard 1-channel variables computed in real time using BrainMaster built-in filter and protocol processing system		
	D, T, A, L, B, H, G, U	channel 1 amplitude (from digital filters) for 8 components
	DELTA, THETA, ALPHA, LOBETA, BETA, HIBETA, GAMMA, USER	channel 1 amplitude (from digital filters) for 8 components
	DTHR, TTHR, ATHR, LTHR, BTHR, HTHR, GTHR, UTHR	channel 1 thresholds (from digital filters built-in autothresolder)
	D1, T1, A1, L1, B1, H1, G1, U1	channel 1 amplitude (from digital filters) for 8 components
	DELTA1, THETA1, ALPHA1, LOBETA1, BETA1, HIBETA1, GAMMA1, USER1	channel 1 amplitude (from digital filters) for 8 components
	C1DA, C1TA, C1AA, C1LA, C1BA, C1HA, C1GA, C1UA	channel 1 amplitude (from digital filters) for 8 components
	C1DF, C1TF, C1AF, C1LF, C1BF, C1HF, C1GF, C1UF	channel 1 modal frequency (from FFT) for 8 components
	C1DE, C1TE, C1AE, C1LE, C1BE, C1HE, C1GE, C1UE	channel 1 percent energy (from FFT) for 8 components
	C1DP, C1TP, C1AP, C1LP, C1BP, C1HP, C1GP, C1UP	channel 1 percent time over threshold (using digital filters)
	C1DT, C1TT, C1AT, C1LT, C1BT, C1HT, C1GT, C1UT	channel 1 thresholds (from digital filters built-in autothresolder)
	C1DV, C1TV, C1AV, C1LV, C1BV, C1HV, C1GV, C1UV	channel 1 variability (from digital filters)
Standard variables for channel 2		
	D2, T2,...DELTA2, THETA2,...C2DA, C2TA,...C2GV, C2UV	channel 2 repeats all channel 1 variables shown above that use a "1" e.g. D1, C1AF, etc., with the "1" replaced by "2"

Standard variables for sum channel		
	DS, TS,...DELTAS, THETAS,...CSDA, CSTA,...CSGV, CSUV	The sum of channels 1 and 2 is always computed and available. Sum Channel repeats all channel1 variables shown above, with "1" replaced by "S"
Standard variables for difference channel		
	DD, TD,...DELTAD, THETAD,...CDDA, CDTA,...CDGV, CDUV	The difference of channels 1 and 2 is always computed and available. Difference Channel repeats all channel1 variables shown above, with "1" replaced by "D"
Cross-channel calculations:		
	Note: use first channel to designate the pair, e.g. channels 1/2 calculations are identified with Channel 1	
	C1DC, C1TC, C1AC, C1LC, C1BC, C1HC, C1GC, C1UC	coherence between channels 1 and 2
	C1DS, C1TS, C1AS, C1LS, C1BS, C1HS, C1GS, C1US	similarity between channels 1 and 2
	C1DH, C1TH, C1AH, C1LH, C1BH, C1HH, C1GH, C1UH	phase between channels 1 and 2
	C1DM, C1TM, C1AM, C1LM, C1BM, C1HM, C1GM, C1UM	comodulation between channels 1 and 2
Values from other events:		
	Events can read real-time data from other events. The events are processed in numerical order, so that the events are evaluated and act in order, e.g. Event 1 before Event 2, etc. Note that all events are checked for to see if any inhibits are generated, before events take action. All data passed between events are treated as double precision, floating-point numbers.	
	E1A, E2A, E3A, E4A, E5A, E6A, E7A, E8A, E9A, E10A, E11A, E12A, E13A, E14A, E15A, E16A	values of "antecedent" variables in Events 1-16. These are the selected component values, or the values of the "x=" equation in the "IF" portion of the event design. Note: These are also the values of "In1", "In2", "In3", through "In16", in the Macromedia Flash Player for BrainMaster

E1, E2, E3, E4, E5, E6, E7, E8, E9, E10, E11, E12, E13, E14, E15, E16	values of "antecedent" variables in Events 1-16. These are the selected component values, or the values of the "x=" equation in the "IF" portion of the event design. Note: These are also the values of "In1", "In2", "In3", through "In16", in the Macromedia Flash Player for BrainMaster
E1B, E2B, E3B, E4B, E5B, E6B, E7B, E8B, E9B, E10B, E11B, E12B, E13B, E14B, E15B, E16B	values of "condition" variables in Events 1-16. These are the selected component values, or the values of the "x=" equation after the "RULE" portion of the event design. Note: These are also the values of "In16", "In17", "In18", through "In32", in the Macromedia Flash Player for BrainMaster
E1F, E2F, E3F, E4F, E5F, E6F, E7F, E8F, E9F, E10F, E11F, E12F, E13F, E14F, E15F, E16F	values of flags for Events 1-16. These are 0 if the event's condition is not met, and 1.0 if the event's condition is met. These are also the values of "Flg1", "Flg2", through "Flg16" in the Macromedia Flash Player for BrainMaster
Built-in Training Control Variables:	
INH1F, ENH1F, NUM1E	channel 1 training flags: number of "stops" meeting criterion, number of "gos" meeting criterion, number of possible "go's"
INH2F, ENH2F, NUM2E	channel 2 training flags: number of "stops" meeting criterion, number of "gos" meeting criterion, number of possible "go's"
Special Built-in Functions	
Zor1(arg)	returns 0 if argument is <1, 1 otherwise. Note: when used with a fraction e.x. X/Y, returns 1.0 if X >= Y, 0.0 otherwise
GT(arg)	returns 0 if argument is <1, 1 otherwise. Note: when used with a fraction e.x. X/Y, returns 1.0 if X >= Y, 0.0 otherwise
Special Built-in Constants:	
Schumann, SCH	Schumann Frequency = 7.81
PHI, GOLDEN, GM	Golden Mean = 1.618

	PI	PI = 3.14159
Standard Operators: Note: all arguments and parameters are treated as double precision floating point values		
	+ - * /	add, subtract, multiply, divide
	%	modulus returns the remainder after an integer division
	^	power: $y = x ^ 2$
	()	parenthetical grouping, unlimited, e.g. (2 + BETA) / THETA
	;	semicolon, needed at end of each equation in formula
	//	comment, single line
	/*...*/	comment, multiple lines
Priority of Operators:		
	()	highest
	^	next
	-x (unary minus)	next (e.g. $y=-x^2$, the ^ occurs before -)
	*/^	next
	+ -	lowest
Standard Built-in Functions:		
	abs(x)	return absolute value
	acos(x)	calculate arccosine
	asin(x)	calculate arcsine
	atan(x)	calculate arctangent
	atan2(x,y)	calculate arctangent with two parameters to preserve quadrant angle
	bessj(n,v)	Bessel function of the first kind. n is order and v is input value
	bessy(n,v)	Bessell function of the second kind. n is order and v is input value.
	Ceil(x)	Find integer ceiling
	Cos(x)	Calculate cosine
	Cosh(x)	Calculate hyperbolic cosine
	exp(x)	calculate exponential function "e to the x"
	floor(x)	Find integer floor
	hypot(a,b)	calculate hypotenuse of right triangle
	log(x)	calculate natural logarithm

	log10(x)	calculate base-10 logarithm
	max(x,y)	return larger of two values
	min(x,y)	return smaller of two values
	rand(x)	get pseudorandom number between 0 and 1
	sin(x)	calculate sine
	sinh(x)	calculate hyperbolic sine
	sqrt(x)	find square root
	srand(x)	initialize pseudorandom series
	tan(x)	calculate tangent
	tanh(x)	calculate hyperbolic tangent
Scripting:		
	x=HIBETA;	equations must include an expression assigning value of "x" and must have a final semicolon (;)
	ratio=T/B; x=10*ratio;	expressions can include more than one equation, separated by semicolons. you may define your own variables. the expression assigning x must be the last one in the definition
	ratio1=A/H; ratio2=A2/H2; x=log(ratio1/ratio2);	many equations may be put together separated by semicolons
	x = Zor1(THETA/TTHR);	built-in functions may be used at any time
	x = ((1-Zor1(THETA/TTHR)) + Zor1(LOBETA/LTHR)) / 2;	complex expressions may be used to construct training values
	x = (D + T + A + L) / (B + H + G);	it is easy to combine components and values in equations
Z-Scores (using optional NeuroGuide Real-Time Extensions for BrainMaster)		
	With this option, the equation processor can access real-time z-score computations based upon the NeuroGuide normative database. (www.appliedneuroscience.com)	
Available output values:		
	ZAP Absolute Power 2 channels / 8 bands	delta, theta, alpha, beta, beta1, beta2, beta3, gamma
	ZRP Relative Power 2 channels / 8 bands	delta, theta, alpha, beta, beta1, beta2, beta3, gamma
	ZPR Power Ratios 2 channels /10 ratios	d/t, d/a, d/b, d/g, t/a, t/b, t/g, a/b, a/g, b/g

	ZAA Amplitude Asymmetry 8 bands	delta, theta, alpha, beta, beta1, beta2, beta3, gamma
	ZCO Coherence 8 bands	delta, theta, alpha, beta, beta1, beta2, beta3, gamma
	ZPH Phase Difference 8 bands	delta, theta, alpha, beta, beta1, beta2, beta3, gamma
	NG bands are:	
	D: Delta (1-4), T: Theta (4-8), A: Alpha (8-12.5), B: Beta (12.5-25.5)	
	G: Gamma (25.5-30.5), 1: Beta 1 (12 – 15.5), 2: Beta 2 (15-18), 3: Beta 3 (18 – 25.5)	
Built-in Z Score Functions and Variables:		
	SetZParms(chan1, chan2, eyes)	used to set which channels Z scores are using, and eyes condition
	CH_FP1, CH_FP2, CH_F3, CH_F4, CH_C3, CH_C4, CH_P3, CH_P4, CH_O1, CH_O2, CH_F7, CH_F8, CH_T3, CH_T4, CH_T5, CH_T6, CH_Fz, CH_Cz, CH_Pz	channel sensor identifiers for use in built-in function SetZParms()
	CH1, CH2	channel identifiers for use in Z-score expressions
	EC, EO	eyes-closed eyes-open identifiers for use in Z-score expressions
	GetZVal(channel, type, band)	calculate a Z score value and return value
	ZV(channel, type, band)	short form of GetZVal()
	ZS(channel, type, band)	short form of GetZVal() ("Z Score")
	CH1, CH2	designates which channel to use for value
	ZAP, ZRP, ZPR, ZAA, ZCO, ZPH	allowable value type identifies (see above)
	NGD, NGT, NGA, NGB, NG1, NG2, NG3, NGG	band identifiers for use in GetZVal, providing Delta, Theta, Alpha, Beta, Beta1, Beta2, Beta3, and Gamma
	1, 2, 3, 4, 5, 6, 7, 8, 9, 10	can also be used for band or power ratio identifiers
Examples of Z Score Training:		
	x=SetZParms(CH_C3, CH_C4, EO);	set up for Z score computation for C3 and C4, eyes open
	x=GetZVal(CH1, ZAP, 1);	get the amplitude z score for delta C3
	x=ZV(CH1, ZPH, NGT);	get the phase difference z score for theta between F3 and F 4
	x=ZV(CH1, ZCO, NG1);	get the coherence z score for beta1 between P3 and P4
	x=ZV(CH1, ZPR, 10);	get power ratio z score number 10 (beta/gamma) for C3
	x=ZS(1, 1, 3);	get channel 1 alpha amplitude
	x=(ZV(CH1, ZAP, NGT)+ZV(CH2, ZAP, NGT))/2	get average of z scores for theta from channels 1 and 2

note: you only need to call SetZParms() once, in the first event that uses z-scores. You should only use one set of parameters at a time, i.e. do not change z-score parameters while running.	
--	--