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CAESAR II Quick Reference Guide



Version 2013 R1 (6.10)

November 2012

DICAS-PE-200103D



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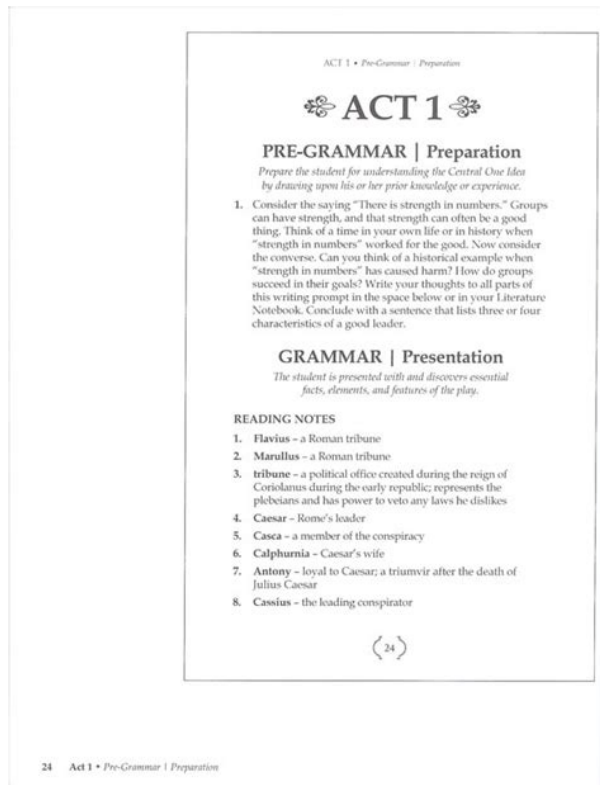
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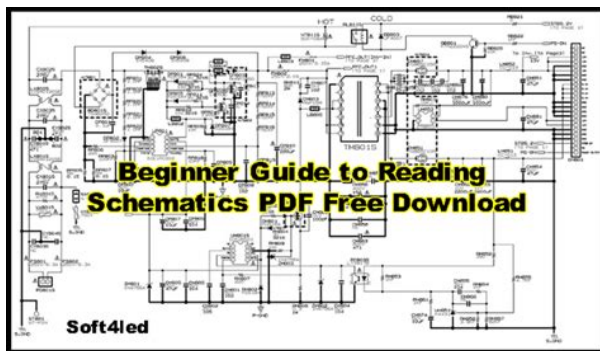
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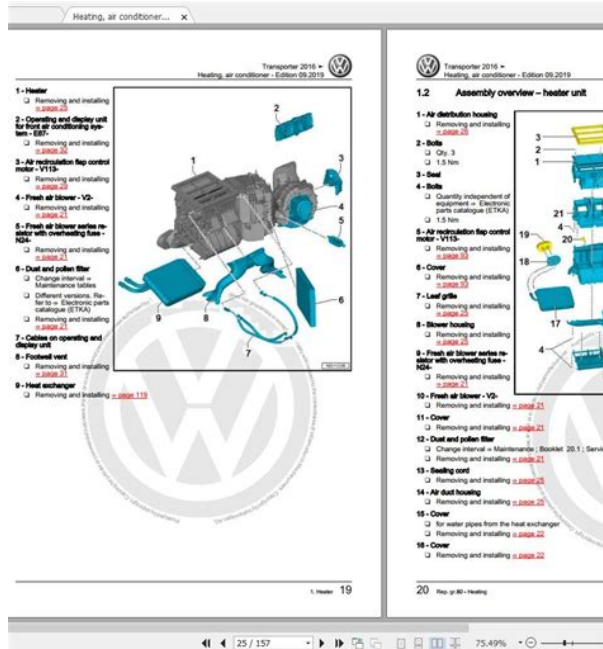


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available from COADE. COADE schedules regular training classes in Houston and provides inhouse and open attendance training around the world. If this file is not found in the current data directory, the installation directory is searched for the configuration file.

<https://cottonsauction.com/images/briggs-and-stratton-repair-manual-3.5-hp.pdf>



If the configuration file is not found, a fatal error will be generated and CAESAR II will terminate. The configuration program produces the Computation Control on page 3 window. Use the tabs to navigate to the appropriate configuration spreadsheets. Important The caesar.cfg file may vary from machine to machine and many of the setup directives modify the analysis. Do not expect the same input file to produce identical results between machines unless the setup files are identical. It is advised that a copy of the setup file be archived with input and output data so that identical reruns can be made. The units file, if modified by the user, would also need to be identical if the same results are to be produced. The following section explains the CAESAR II setup file options. They are grouped as they appear when chosen from the tabs on the Configure window. Chapter 2 Configuration and Environment 3 Computation Control Computational Control Configuration Settings Use Pressure Stiffening This flag enables CAESAR II to include pressurestiffening effects in those codes that do not explicitly require its use. In these cases pressurestiffening effects will apply to all bends, elbows, and both miter types. In all cases, the pressure used is the maximum of all pressures defined for the element. Missing Mass ZPA The default for this option is Extracted, which means that CAESAR II will use the spectrum value at the last “extracted” mode. Changing this value to SPECTRUM instructs CAESAR II to use the last spectrum value as the ZPA for the missing mass computations. Bend Axial Shape For bends 45 degrees or smaller, a major contributor to deformation can be the axial displacement of the shortarched pipe. With the axial shape function disabled this displacement mode is ignored and the bend will be stiffer. 4 CAESAR II Technical Reference Manual Rod Tolerance degrees The angular plusorminus permitted convergence error. The default of CAESAR II is 1.0 degree.

<http://cqitracker.com/images/briggs-and-stratton-ready-start-manual.pdf>

CAESAR II

Quick Reference Guide



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For systems subject to large horizontal displacements, values of 5.0 degrees for convergence tolerances have been used successfully. Rod Increment degrees The maximum amount of angular change that any one support can experience between iterations. For difficult to converge problems, values of 0.1 have proven effective here. When small values are used, however, the user should be prepared for a large number of iterations. The default is 0.05. This means that any entry in the Temp fields whose absolute magnitude is less than 0.05 is taken to be a thermal expansion coefficient in terms of inches per inch dimensionless. Use of this field provides some interesting modeling tools. If an Alpha Tolerance of 1.1 is set, then an entry in the Temp 2 field of 1 causes the element defined by this expansion coefficient to shrink to zero length. If this does not accurately represent the installed, or zero expansion strain state, then enter a different value in this field. Friction Stiffness Friction restraint stiffness. This is the first parameter that should be adjusted to help a slowly converging problem where friction is suspected. Chapter 2 Configuration and Environment 5 Friction Normal Force Variation This tolerance, default of 0.15, or 15 percent, is the amount of variation in the normal force that is permitted before an adjustment will be made in the sliding friction force. This value normally should not be adjusted. Friction Angle Variation Friction sliding angle variation. The default is 15 degrees. This parameter had more significance in versions prior to 2.1. This parameter is currently only used in the first iteration when a restraint goes from the non-sliding to sliding state. All subsequent iterations compensate for the angle variation automatically. Coefficient of Friction Mu The value specified here is applied by default as the coefficient of friction to all translational restraints. Specifying a value of zero, the default, means that no friction is applied.

WRC107 Version This directive sets the Version of the WRC107 bulletin used in the computations. Valid options are August 1965 March 1979 March 1979 with the 1B11 and 2B1 off axis curves default WRC107 Interpolation Method The curves in WRC Bulletin 107 cover essentially all applications of nozzles in vessels or piping; however, should any of the interpolation parameters i.e., U, Beta, etc. fall outside the limits of the available curves then some extension of the WRC method must be used. The default is to use the last value in the particular WRC table. Alternatively, the user may control this extensions methodology interactively. This causes the program to prompt the user for curve values when necessary. Incore Numerical Check Enables the incore solution module to test the stability of the solution for the current model and loadings. If this ratio is greater than the

decomposition singularity tolerance, then a numerical error may occur. This problem does not have to be associated with a system singularity. The outofcore solution will, however, stop with a singularity message. This solution abort will prevent any possibility of an errant solution. These solutions have several general characteristics. When machine precision errors of this type occur they are very local in nature, affecting only a single element or very small part of the model, and are readily noticeable upon inspection. The 1E10 limit can be increased to 1E11 or 1E12 and still provide a reasonable check on solution accuracy. Any solution computed after this limit has been increased should always be checked closely for "reasonableness." At 1E11 or 1E12 the number of significant figures in the local solution has been reduced to two or three. The 1E10 limit can be increased to 1E20 or 1E30 to get the job to run, but the user should remember that the possibility for a locally errant solution exists when stiffness ratios are allowed to get this high. Solutions should be carefully checked.

<http://www.holderit.com/wp-content/plugins/formcraft/file-upload/server/content/files/1626f9b41ca734---bose-acoustic-wave-music-system-ii-owners-manual.pdf>

Minimum Wall Mill Tolerance % Use this directive is to specify the default percentage of wall thickness allowed for mill and other mechanical tolerances. Mill tolerance is usually not considered in the flexibility analysis. By default this value is 12.5, corresponding to a 12.5% tolerance. To eliminate mill tolerance consideration, set this directive to 0.0. Chapter 2 Configuration and Environment 7 Bourdon Pressure Select the BOURDON PRESSURE EFFECT from the drop list. If the BOURDON EFFECT is not activated there will be no global displacements due to pressure. Note The BOURDON EFFECT translation only is always considered when FRP pipe is used, regardless of the actual setting of the BOURDON FLAG. Ignore Spring Hanger Stiffness Enabling this option causes CAESAR II to ignore the stiffness of spring hangers in the analysis. This option is consistent with hand computation methods of spring hanger design, which ignored the effects of the springs. Important COADE recommends that this value never be changed. Include Spring Stiffness in Hanger OPE Travel Cases Enabling this option defaults CAESAR II to place the designed spring stiffness into the Hanger Operating Travel Case and iterate until the system balances. This iteration scheme therefore considers the effect of the spring hanger stiffness on the thermal growth of the system vertical travel of the spring. If this option is used, it is very important that the hanger load in the cold case in the physical system be adjusted to match the reported hanger Cold Load. Disabling this option defaults the program to design spring hangers the traditional way. 8 CAESAR II Technical Reference Manual Hanger Default Restraint Stiffness Where hangers are adjacent to other supports or are themselves very close for example where there are two hangers on either side of a trunnion support, the CAESAR II hanger design algorithm may generate poorly distributed hot hanger loads in the vicinity of the close hangers.

Using a more flexible support for computing the hanger restrained weight loads often allows the design algorithm to more effectively distribute the system's weight. This code will be used as the default if no code is specified in the problem input. The default piping code is B31.3, the chemical plant and petroleum refinery code. The default for B31.1 applications is 15%. If this is too high for the material and temperature specified then a smaller occasional load factor can be input. Chapter 2 Configuration and Environment 11 Yield Stress Criterion The 132 column stress report produced by CAESAR II contains a value representative of the maximum stress state through the cross section, computed per the indicated yield criteria theory. CAESAR II can compute this maximum stress note, this is not a Code stress according to either Von Mises Theory or the Maximum Shear Theory. The selected stress is computed at four points along the axis normal to the plane of bending outside top, inside top, inside bottom, outside bottom, and the maximum value is printed in the stress report. The equations used for each of these yield criteria are listed below. For these three codes, the equations shown in the code are used to determine the yield criterion, not the standard mechanical stress

equations shown below. Previously this was not permitted, and the code defined SIF was always used. If the user enables this directive, he may override the code's calculated SIF for bends. The user entered SIF acts over the entire bend curvature and must be specified at the "TO" end of the bend element. The default is off. Use WRC329 This directive activates the WRC329 guidelines for all intersections, not just for reduced intersections. The recommendations made by Rodabaugh in section 5.0 of WRC329 will be followed exactly in making the stress calculations for intersections. Every attempt has been made to improve the stress calculations for all codes, not just the four discussed in Rodabaugh's paper.

Users not employing either B31.1, B31.3 or the ASME NC or ND codes, and who wish to use WRC329 are encouraged to contact COADE for additional information. Throughout this document WRC330 and WRC329 are used synonymously 330 was the draft version of 329. When finally published, the official WRC designation was 329. Use Schneider This directive activates the Schneider reduced intersection assumptions. It was because of observations by Schneider that much of the work on WRC 329 was started. All Cases Corroded A recent version of the B31.3 piping code mentioned reducing the section modulus for sustained or occasional stress calculations by the reduction in wall thickness due to corrosion. Several users have interpreted this to mean that the reduced section modulus should be used for all stress calculations, including expansion. This directive allows those users to apply this conservative interpretation of the code. Enabling All Cases Corroded causes CAESAR II to use the corroded section modulus for the calculation of all stress types. Deactivating this option causes new jobs to default to not using this allowable. WRC 329 Allows the user to use the recommendations of WRC 329 for reduced intersections. In all cases the WRC 329 values should be more accurate, and more truly inline with the respective codes intent. The default is to use the ID of the pipe. Most piping codes consider the effects of pressure in the longitudinal component of the CODE stress. Usually, the value of the hoop stress has no bearing on the CODE stress, so changing this directive does not affect the acceptability of the piping system. If desired, the user may change the way CAESAR II computes the hoop stress value. Some codes permit this simplified form when the pipe wall thickness is thin. This option is used most often when users are comparing CAESAR II results to those from an older pipe stress program. The more comprehensive calculation, i.e. the Default, is recommended.

Setting this directive to Default causes CAESAR II to use whatever the currently active piping code recommends. Chapter 2 Configuration and Environment 15 Add Torsion in SL Stress Some piping codes include torsion in the sustained and occasional stresses by explicitly including it in the stress equation i.e. B31.1, and some don't include torsion in the sustained and occasional stresses by implicitly calling for "longitudinal stresses" only i.e. B31.3. Setting the Add Torsion in SL Stress directive to Yes forces CAESAR II to include the torsion term in those codes that don't include it already by default. Setting this directive to Default causes CAESAR II to use whatever the currently active piping code implies. In a sustained stress analysis of a very hot piping system subject to creep, it is recommended that the user include torsion in the sustained stress calculation via this parameter in the setup file. Stress Stiffening Due to Pressure This flag instructs the program to include pressure stiffening effects on straight pipes. These rules didnot define a separate branch SIF for the reduced branch end. The branch stress intensification factor will be the same as the header stress intensification factor regardless of the branchtoheader diameter ratio. B31.1 Post 1980 Allows the B31.1 code user to employ the post1980 code rules for reduced intersections. The reduced intersection SIF equations in B31.1 from 1980 through 1989 generated unnecessarily high SIFs because of a mistake made in the implementation. This is as per WRC329. For this reason many users opted for the "Pre 1980" B31.1 SIF calculation discussed above. WRC 329 Allows the user to use the recommendations of WRC329 for reduced intersections. In all cases the WRC329 values should be more accurate, and more truly inline with the respective codes intent. ASME Sect. III Allows the user to use the 1985 ASME Section III NC and ND rules for reduced intersections.

Schneider Activates the Schneider reduced intersection stress intensification factor multiplication. Has the same effect as the Use Schneider option. Chapter 2 Configuration and Environment 17 Class 1 Branch Flexibility Activates the Class 1 flexibility calculations. The appearance of this parameter in the setup file will completely change the modeling of intersections in the analysis. A perfectly rigid junction between the centerline of the header and surface will be formed automatically by CAESAR II using the element offset calculations. SIFs act at the surface point for the branch. When the reduced branch rules are satisfied, the local flexibility of the header is also inserted at this surface point. Intersections not satisfying the reduced intersection rules will be “stiffer” and carry more load, while intersections satisfying the reduced intersection rules will be more flexible and will carry less load. All changes to the model are completely transparent to the user. In systems where the intersection flexibility is a major component of the overall system stiffness, the user is urged to run the analysis both with and without the Class 1 Branch Flexibility active to determine the effect this modeling on the analysis. For more technical discussion, refer to Class 1 Branch Flexibilities on page 14. B31.1 Reduced Z Fix This directive is used in conjunction with B31.1, and makes the correction to the reduced branch stress calculation that existed in the 1980 through 1989 versions of B31.1. This error was corrected in the 1989 version of B31.1, and the B31.1 Reduced Z Fix is on by default in CAESAR II. Part of the discussion centers around just what should be considered a reduced fitting. The CAESAR II default is to assume that welding tees and reinforced fabricated tees are covered by the reduced fitting expressions, even though the reduced fitting expressions do not explicitly cover these intersection types.

This directive controls whether or not this more conservative approach is used. Prior to Version 4.30, CAESAR II always applied Note 2, the more conservative approach, and there was no way to alter this behavior. The user can control through the use of this directive whether or not Note 2 is implemented. The default behavior is to use the two different SIF values and not employ Note 2. Pressure Variation in Expansion Cases This directive controls whether or not any pressure variation between the referenced load cases will appear in the resulting expansion load case. 18 CAESAR II Technical Reference Manual Geometry Directives Geometry Directives Configuration Settings Connect Geometry Through Cnodes Restraints, flexible nozzles, and spring hangers may be defined with connecting nodes. By default CAESAR II ignores the position of the restraint node and the connecting node. They may be at the same point or they may be hundreds of feet apart. This directive allows the user to insist that each restraint, nozzle, or hanger exists at the same point in space as its connecting node. In many cases, enabling this option will cause “plotwise” disconnected parts of the system to be reconnected and to appear “as expected” in both input and output plots. Auto Node Number Increment This directive sets the value for the Automatic Node Numbering routine. Any nonzero, positive value in this data cell is used to automatically assume the “TO NODE” value on the piping input spreadsheets. If this value is set to 0.0, automatic node numbering is disabled. Chapter 2 Configuration and Environment 19 ZAxis Vertical By default CAESAR II assumes the Y axis is vertical with the X and Z axes in the horizontal plane. If desired, the Z axis can be made vertical by checking this box. In this case, the X and Y axes will be in the horizontal plane. Minimum Allowed Bend Angle Very small angles, short radius bends can cause numerical problems during solution.

When the user has a reasonable radius and a small angle there are usually no problems. However, if the small angle bend is grossly small compared to the surrounding elements then the bend should probably not be used and a different modeling approach employed. Enabling this directive allows the user to reset the minimum angle CAESAR II will accept for a bend angle. The default is 5.0 degrees. Maximum Allowed Bend Angle Very large angles, short radius bends can cause numerical problems during solution. When the user has a reasonable radius and a large angle there are usually no problems. However, if the large angle bend plots compared reasonably well to the surrounding elements then the bend can probably be used without difficulty. Wellproportioned bends up to 135

degrees have been tested without a problem. Enabling this directive allows the user to reset the maximum angle CAESAR II will accept for a bend. The default is 95 degrees. Bend Length Attachment Percent Whenever the element leaving the tangent intersection of a bend is within n% of the bend radius on either side of the weldline, CAESAR II inserts an element from the bend weldline to the "TO" node of the element leaving the bend. The inserted element has a length equal to exactly n% of the bend radius. The user may adjust this percentage to reduce the error due to the inserted element, however, the length tolerance for elements leaving the bend will also be reduced. To obtain more accurate results the user must include less "slop" in the system dimensions around bends. The default attachment is 1.0 percent. Minimum Angle to Adjacent Bend Nodes on a bend curvature that are too close together can cause numerical problems during solution. Where the radius of the bend is large, such as in a cross country pipeline, it is not uncommon to find nodes on a bend curvature closer than 5 degrees.

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