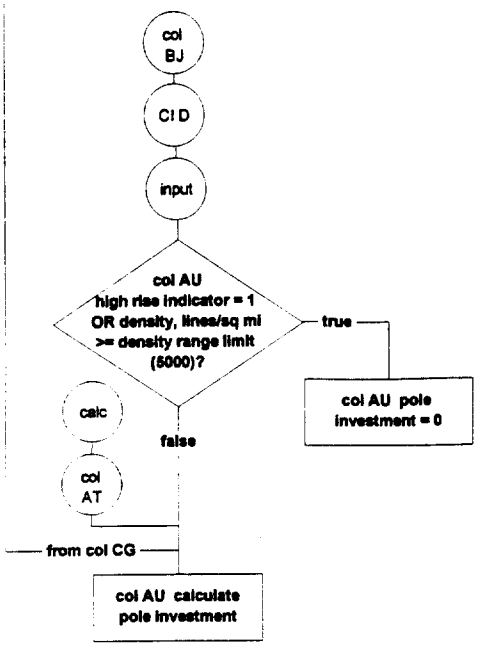
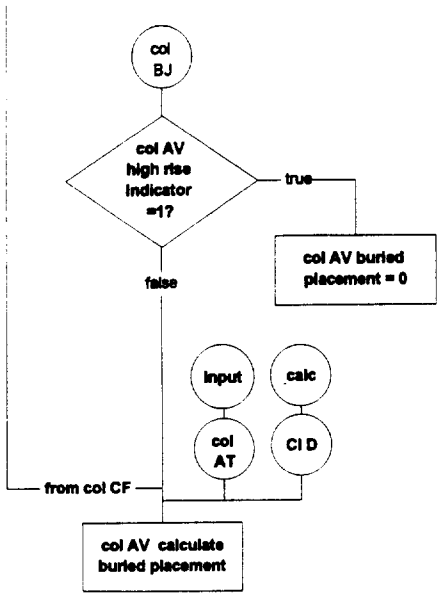
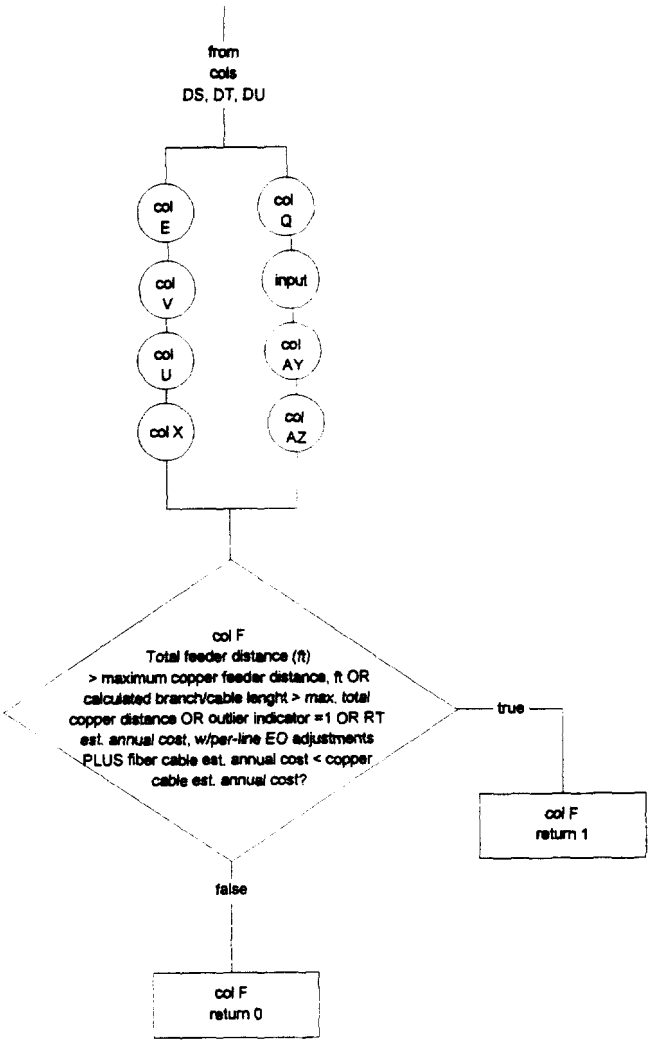
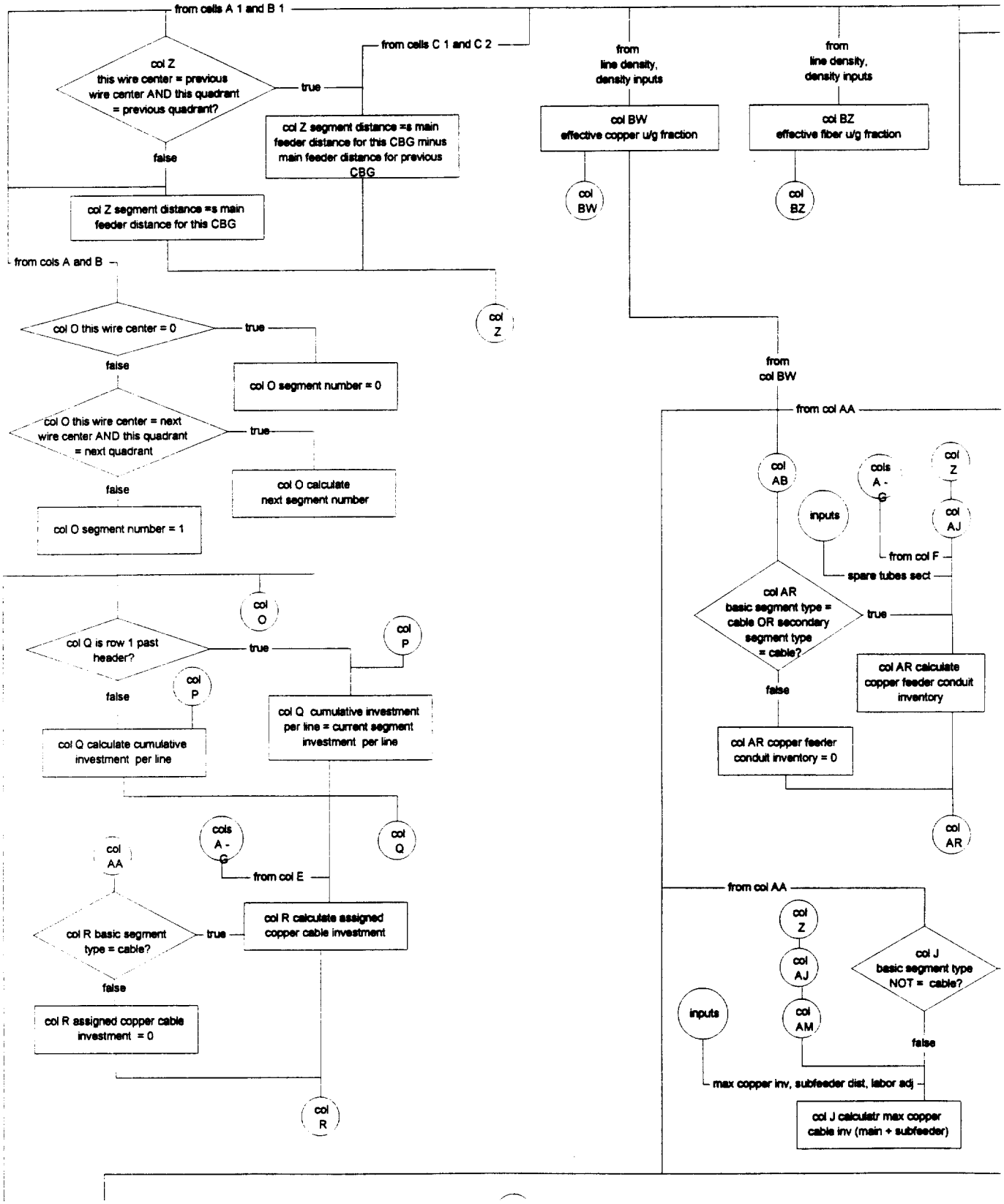

col BJ
CI D
input
col AU high rise indicator = 1 OR density, lines/sq mi >= density range limit (5000)?
true
col AU pole investment = 0
calc
col AT
false
from col CG
col AU calculate pole investment


col BJ
col AV high rise indicator =1?
true
col AV buried placement = 0
false
input
calc
col AT
CI D
from col CF
col AV calculate buried placement

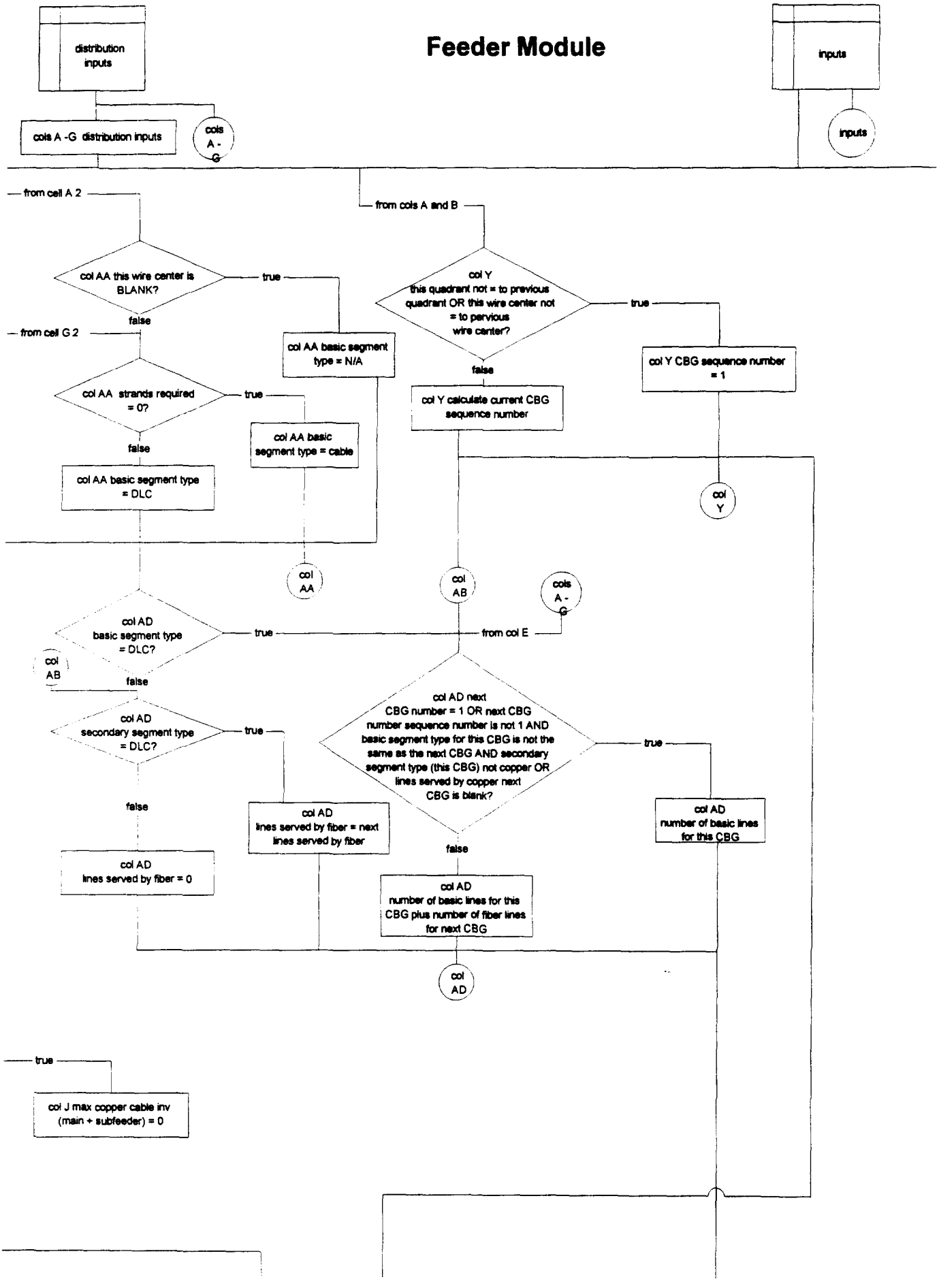

from
cols
DS, DT, DU
col E
col V
col U
col X
col Q
input
col AY
col AZ
col F
Total feeder distance (ft)
> maximum copper feeder distance, ft OR
calculated branch/cable lenght > max. total
copper distance OR outlier indicator =1 OR RT
est. annual cost, w/per-line EO adjustments
PLUS fiber cable est. annual cost < copper
cable est. annual cost?
true
col F
return 1
false
col F
return 0

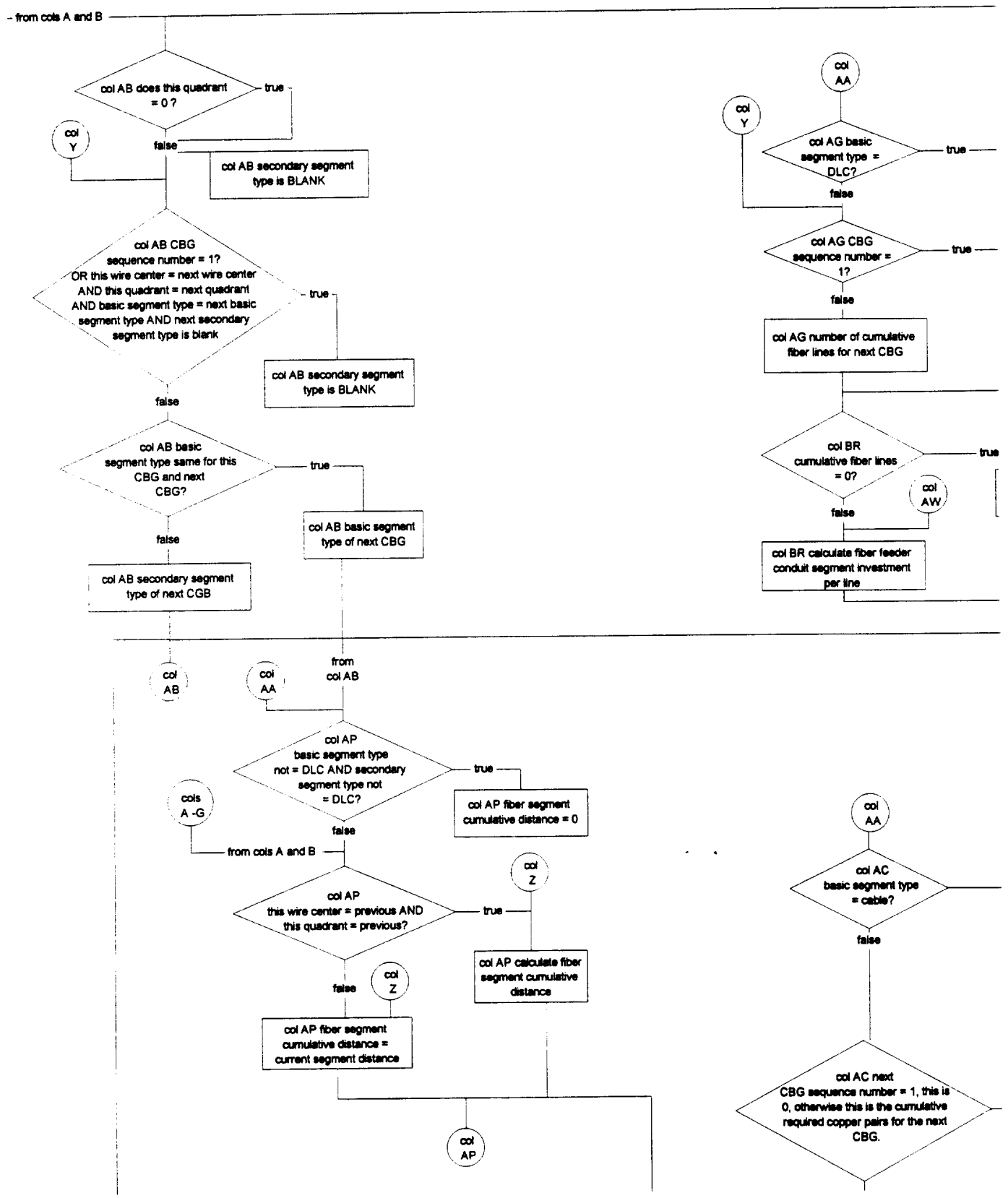
HM 5.0
Feeder Module
Flows

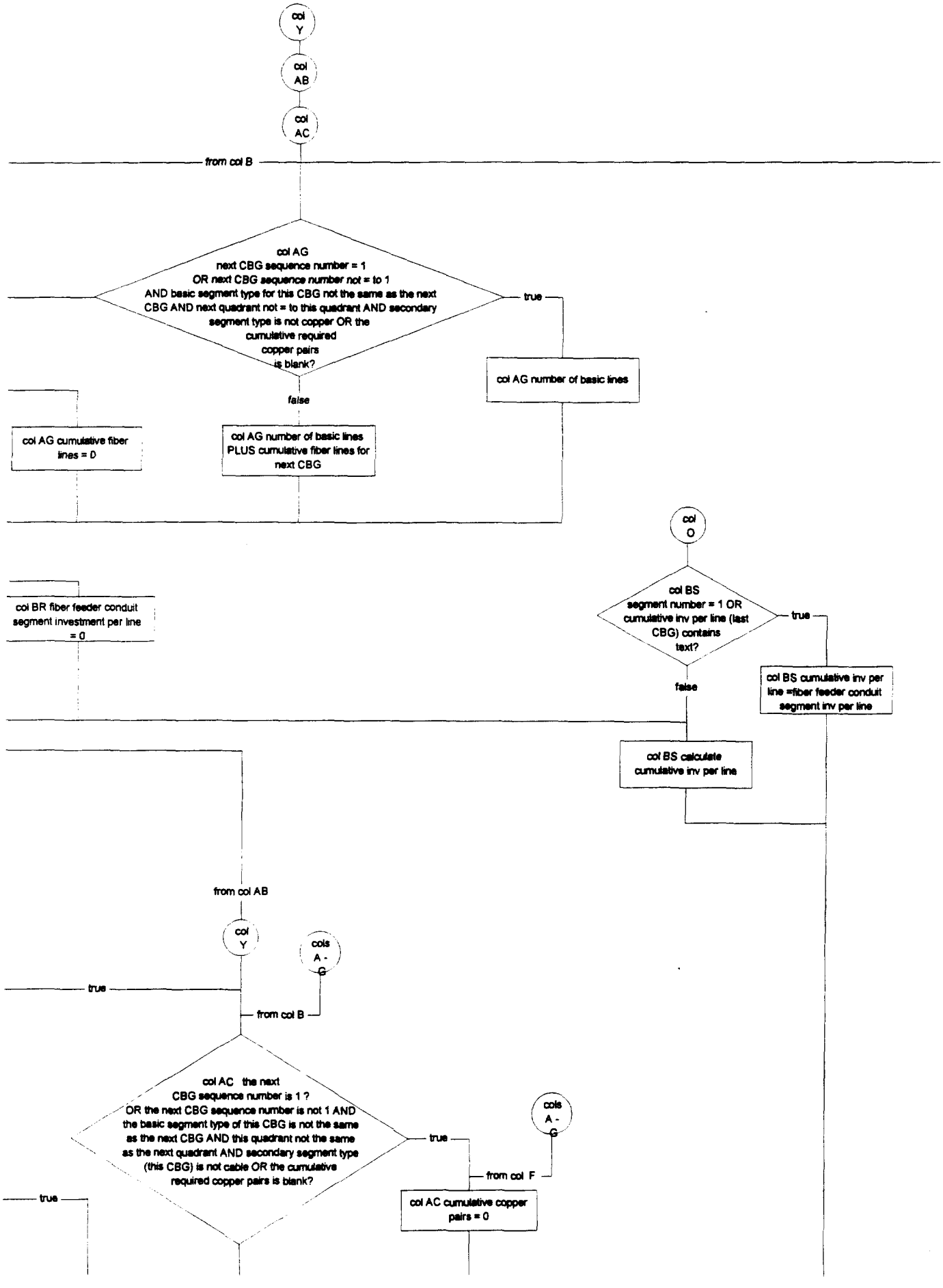
1	2	3	4	5
6	7	8	9	10
11	12	13	14	15
16	17	18	19	20


from cells A 1 and B 1
col Z
this wire center = previous wire center AND this quadrant = previous quadrant?
true
false
from cells C 1 and C 2
col Z segment distance =s main feeder distance for this CBG minus main feeder distance for previous CBG
col Z segment distance =s main feeder distance for this CBG
from line density, density inputs
col BW
effective copper u/g fraction
from line density, density inputs
col BZ
effective fiber u/g fraction
col BW
col BZ
col Z
from cols A and B
col O this wire center = 0
true
false
col O segment number = 0
col O this wire center = next wire center AND this quadrant = next quadrant
true
false
col O calculate next segment number
col O segment number = 1
col O
col Q is row 1 past header?
true
false
col P
col P
col Q cumulative investment per line = current segment investment per line
col Q calculate cumulative investment per line
col Q
cols A - G
from col E
col AA
col R basic segment type = cable?
true
false
col R calculate assigned copper cable investment
col R assigned copper cable investment = 0
col R
from col BW
from col AA
col AB
cols A - G
col Z
inputs
col AJ
from col F
spare tubes sect
col AR
basic segment type = cable OR secondary segment type = cable?
true
false
col AR calculate copper feeder conduit inventory
col AR copper feeder conduit inventory = 0
col AR
from col AA
col Z
col AJ
col AM
inputs
col J
basic segment type NOT = cable?
false
max copper inv, subfeeder dist, labor adj
col J calculatr max copper cable inv (main + subfeeder)

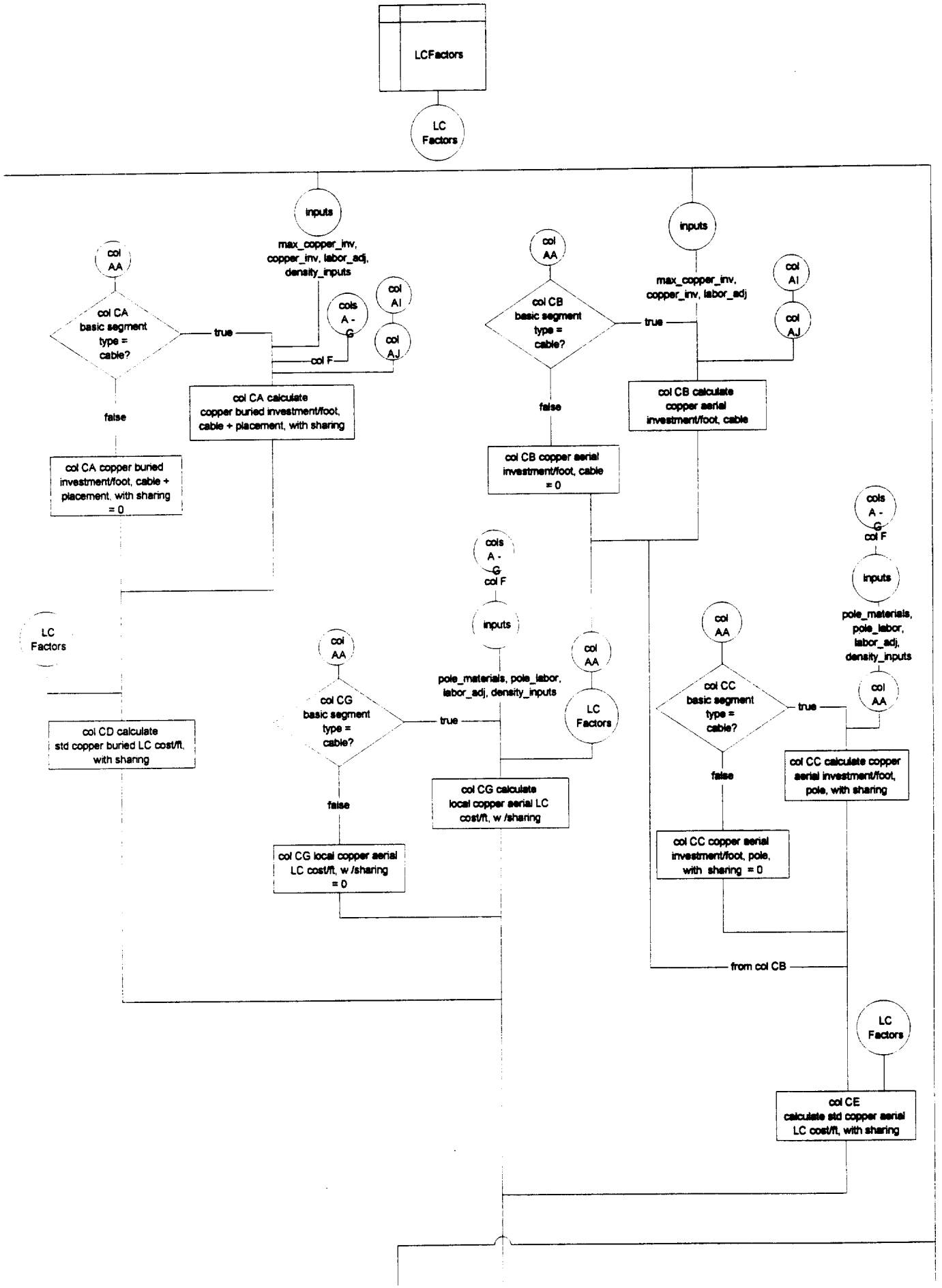
Feeder Module



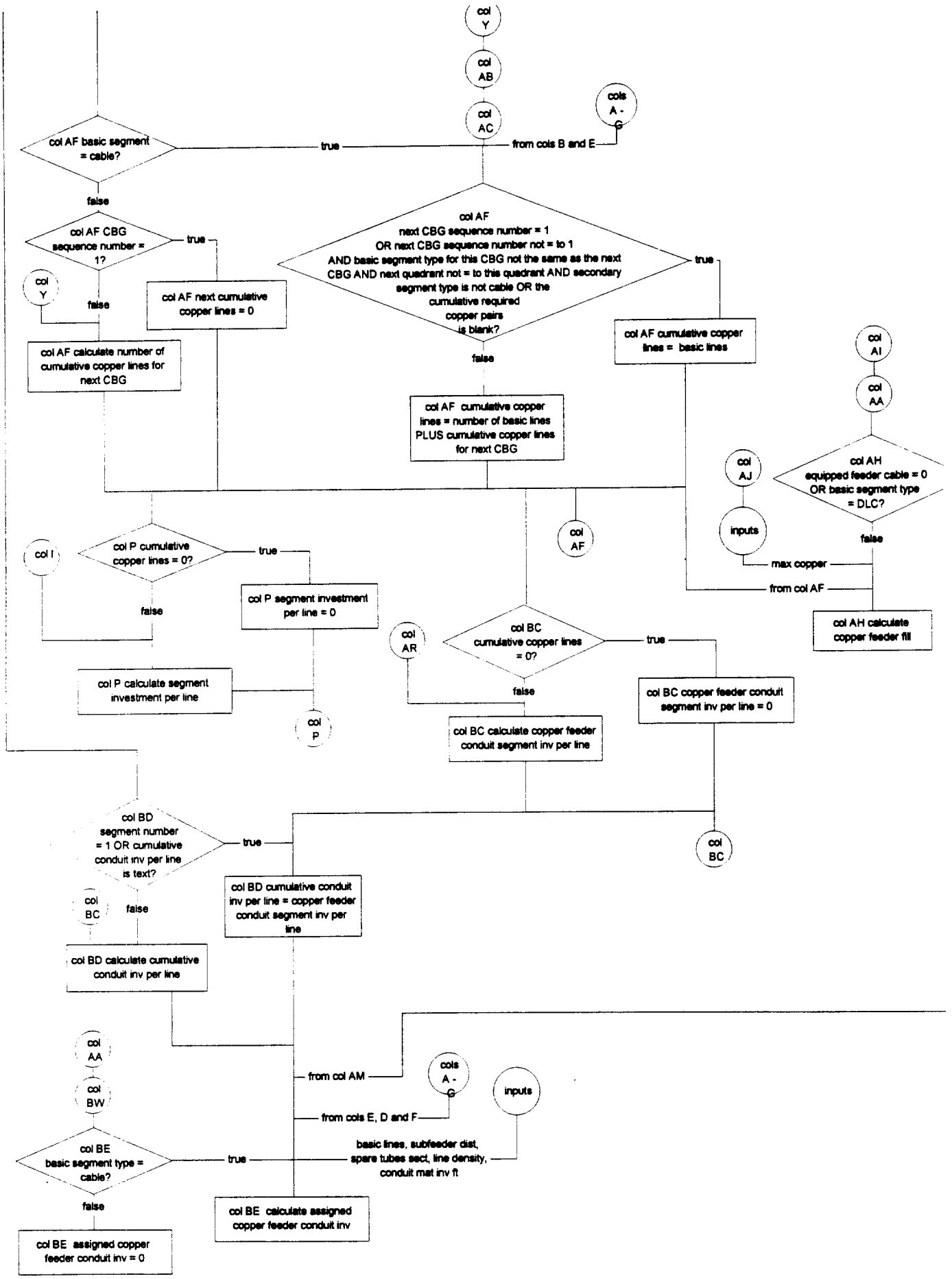

from cols A and B
col AB does this quadrant = 0 ?
true
false
col Y
col AB secondary segment type is BLANK
col AB CBG sequence number = 1? OR this wire center = next wire center AND this quadrant = next quadrant AND basic segment type = next basic segment type AND next secondary segment type is blank
true
col AB secondary segment type is BLANK
false
col AB basic segment type same for this CBG and next CBG?
true
col AB basic segment type of next CBG
false
col AB secondary segment type of next CGB
col AA
col Y
col AG basic segment type = DLC?
true
false
col AG CBG sequence number = 1?
true
false
col AG number of cumulative fiber lines for next CBG
col BR cumulative fiber lines = 0?
true
false
col AW
col BR calculate fiber feeder conduit segment investment per line
col AB
col AA
from col AB
col AP basic segment type not = DLC AND secondary segment type not = DLC?
true
col AP fiber segment cumulative distance = 0
cols A -G
false
from cols A and B
col Z
col AP this wire center = previous AND this quadrant = previous?
true
col AP calculate fiber segment cumulative distance
false
col Z
col AP fiber segment cumulative distance = current segment distance
col AP
col AA
col AC basic segment type = cable?
false
col AC next CBG sequence number = 1, this is 0, otherwise this is the cumulative required copper pairs for the next CBG.

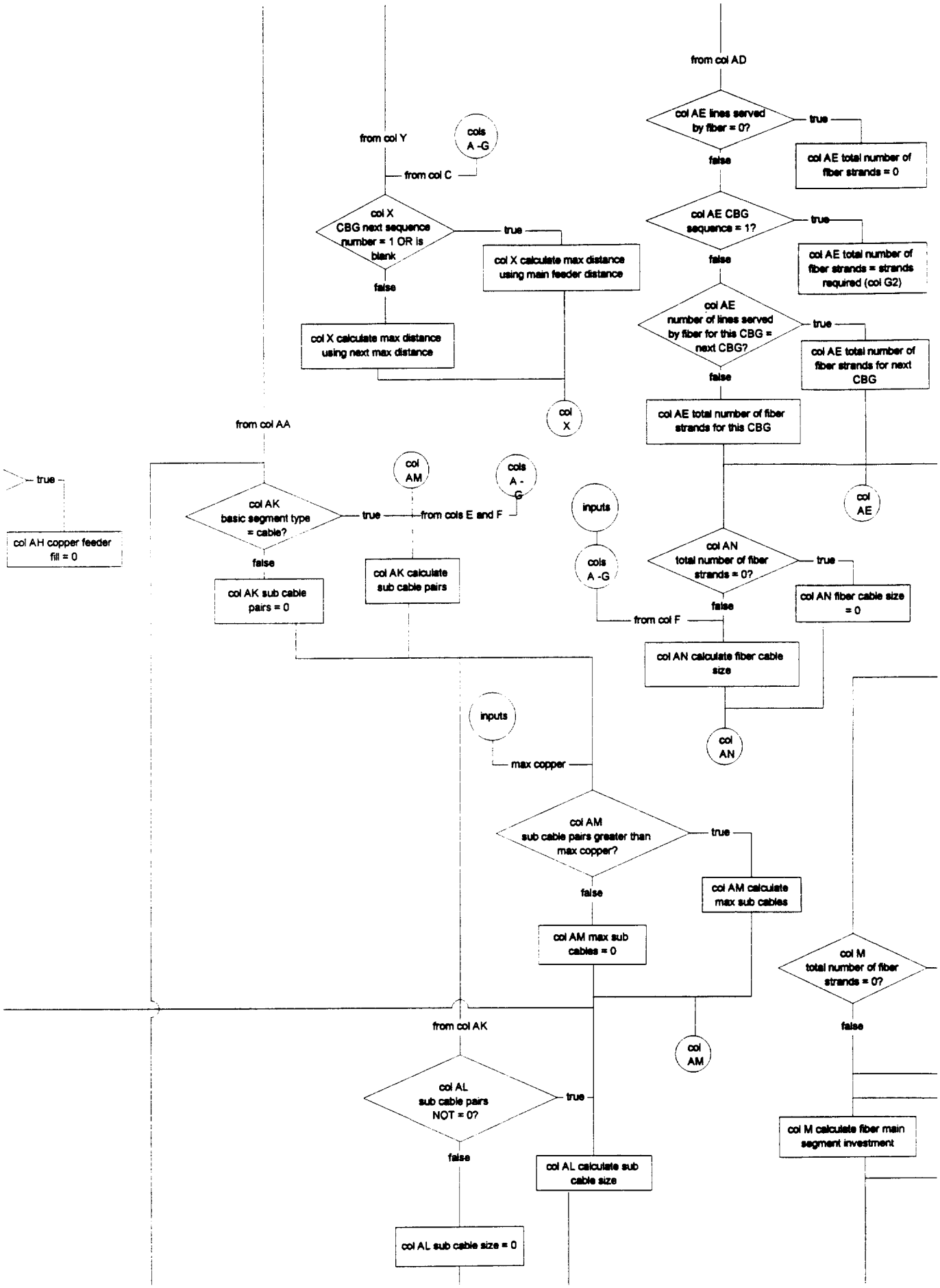

col Y
col AB
col AC
from col B
col AG
next CBG sequence number = 1
OR next CBG sequence number not = to 1
AND basic segment type for this CBG not the same as the next CBG AND next quadrant not = to this quadrant AND secondary segment type is not copper OR the cumulative required copper pairs is blank?
true
col AG number of basic lines
false
col AG cumulative fiber lines = 0
col AG number of basic lines PLUS cumulative fiber lines for next CBG
col O
col BR fiber feeder conduit segment investment per line = 0
col BS
segment number = 1 OR cumulative inv per line (last CBG) contains text?
true
col BS cumulative inv per line =fiber feeder conduit segment inv per line
false
col BS calculate cumulative inv per line
from col AB
col Y
cols A - G
true
from col B
col AC the next CBG sequence number is 1 ?
OR the next CBG sequence number is not 1 AND the basic segment type of this CBG is not the same as the next CBG AND this quadrant not the same as the next quadrant AND secondary segment type (this CBG) is not cable OR the cumulative required copper pairs is blank?
true
cols A - G
from col F
col AC cumulative copper pairs = 0
true

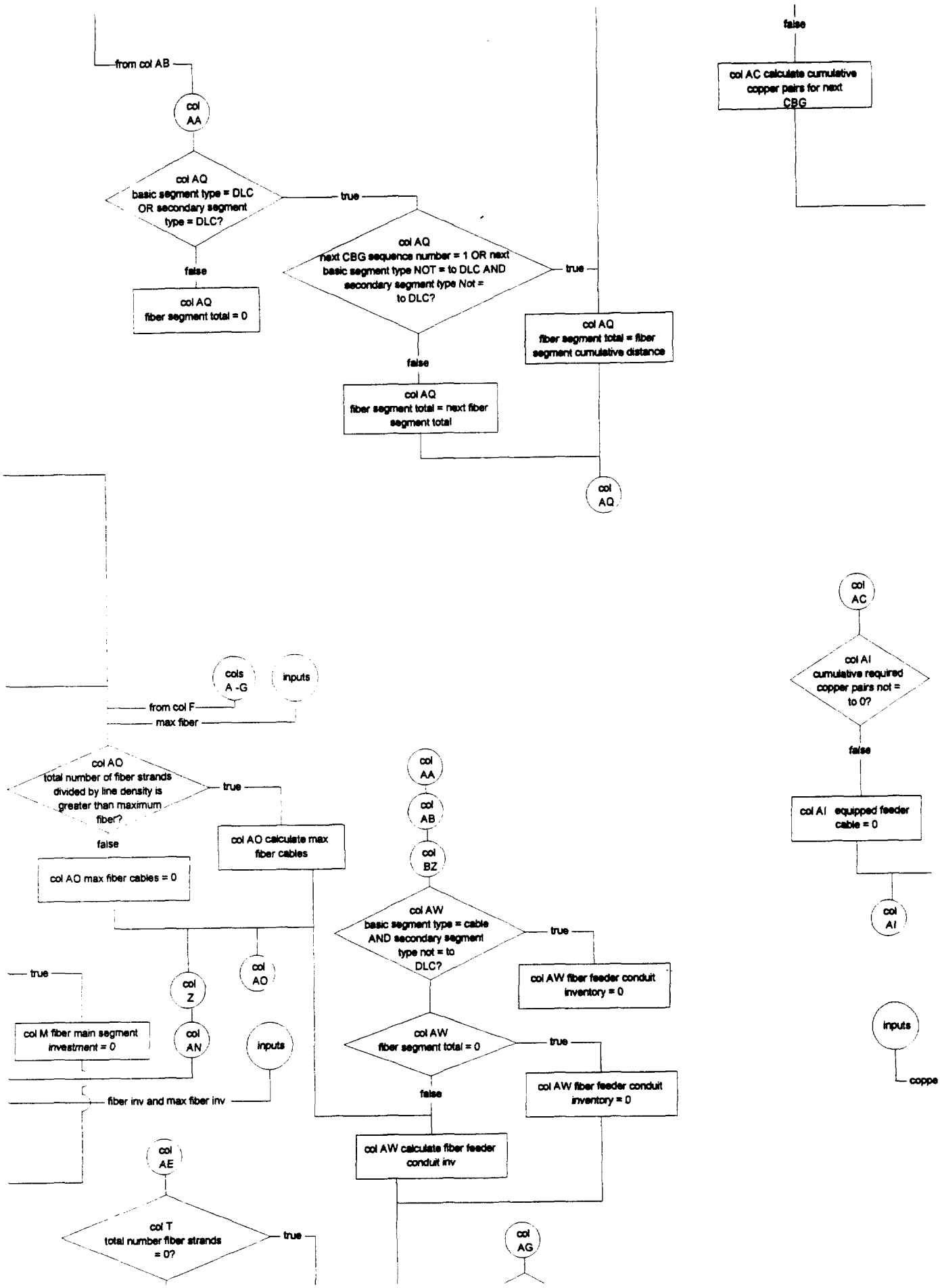
4

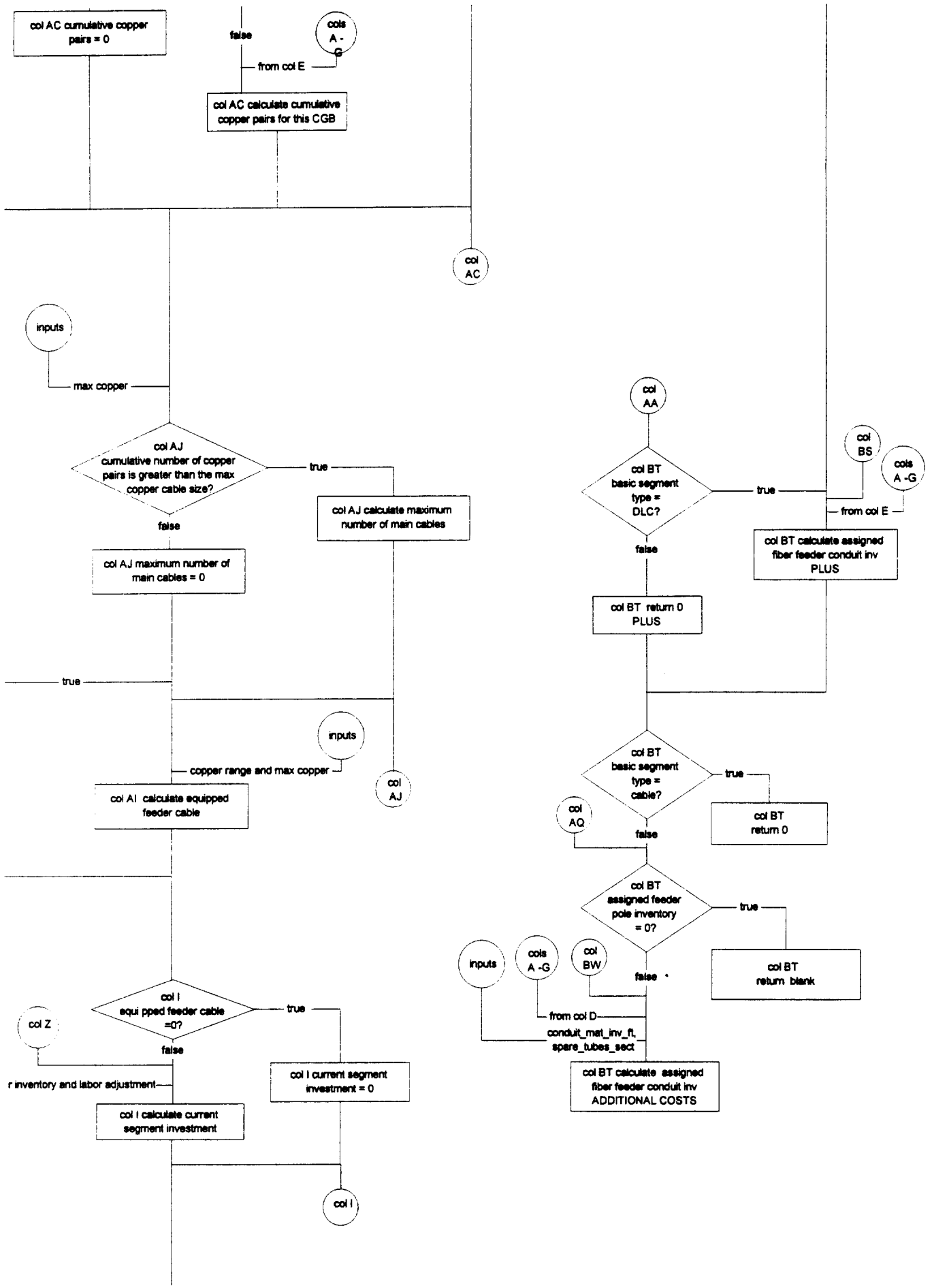

LCFactors
LC Factors
inputs
max_copper_inv, copper_inv, labor_adj, density_inputs
col AA
col CA basic segment type = cable?
true
false
cols A - G
col AI
col AJ
col F
col CA calculate copper buried investment/foot, cable + placement, with sharing
col CA copper buried investment/foot, cable + placement, with sharing = 0
LC Factors
col CD calculate std copper buried LC cost/ft, with sharing
inputs
max_copper_inv, copper_inv, labor_adj
col AA
col CB basic segment type = cable?
true
false
col AI
col AJ
col CB calculate copper aerial investment/foot, cable
col CB copper aerial investment/foot, cable = 0
cols A - G
col F
inputs
pole_materials, pole_labor, labor_adj, density_inputs
col AA
col CG basic segment type = cable?
true
false
col CG calculate local copper aerial LC cost/ft, w /sharing
col CG local copper aerial LC cost/ft, w /sharing = 0
col AA
LC Factors
cols A - G
col F
inputs
pole_materials, pole_labor, labor_adj, density_inputs
col AA
col CC basic segment type = cable?
true
false
col AA
col CC calculate copper aerial investment/foot, pole, with sharing
col CC copper aerial investment/foot, pole, with sharing = 0
from col CB
LC Factors
col CE calculate std copper aerial LC cost/ft, with sharing

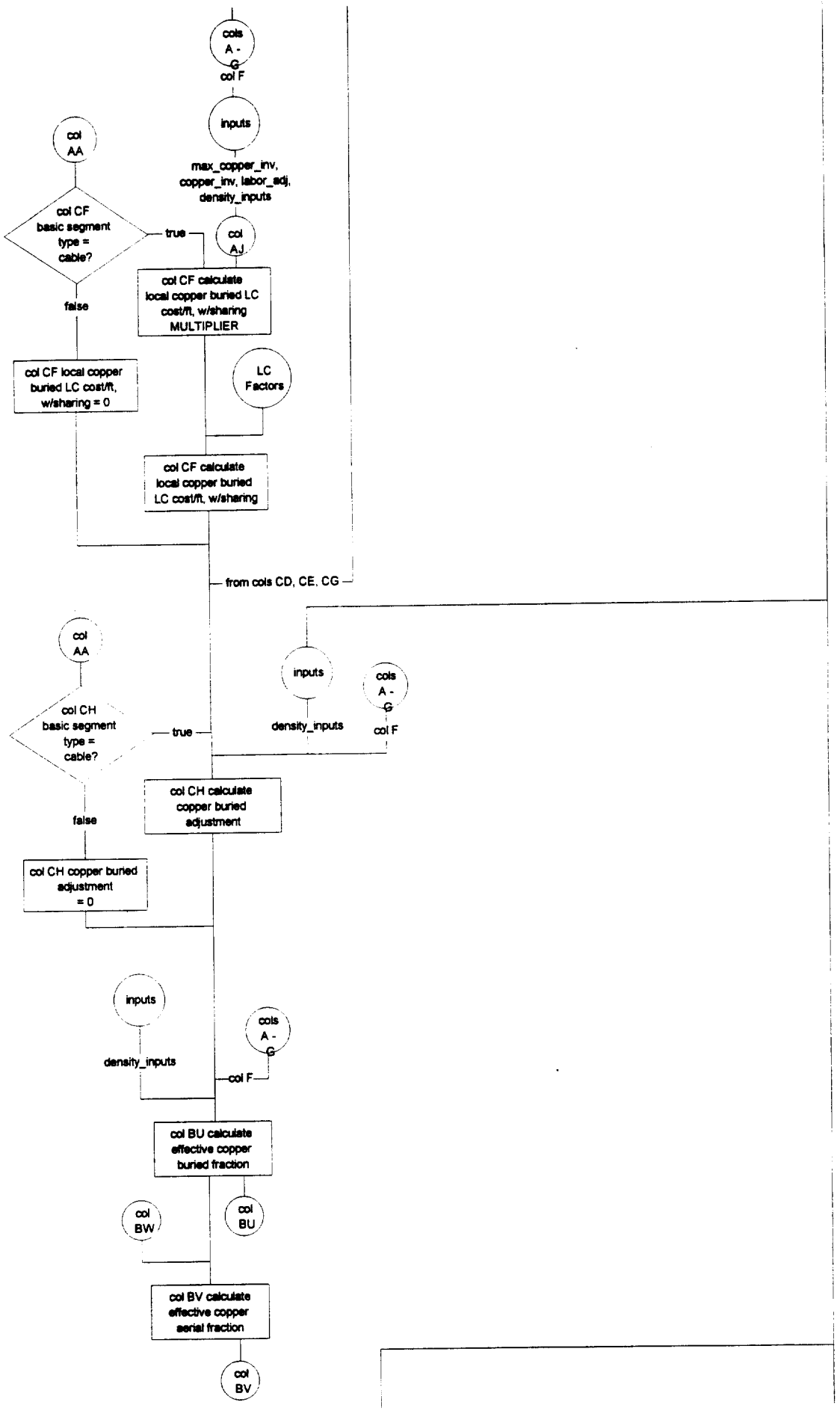
S

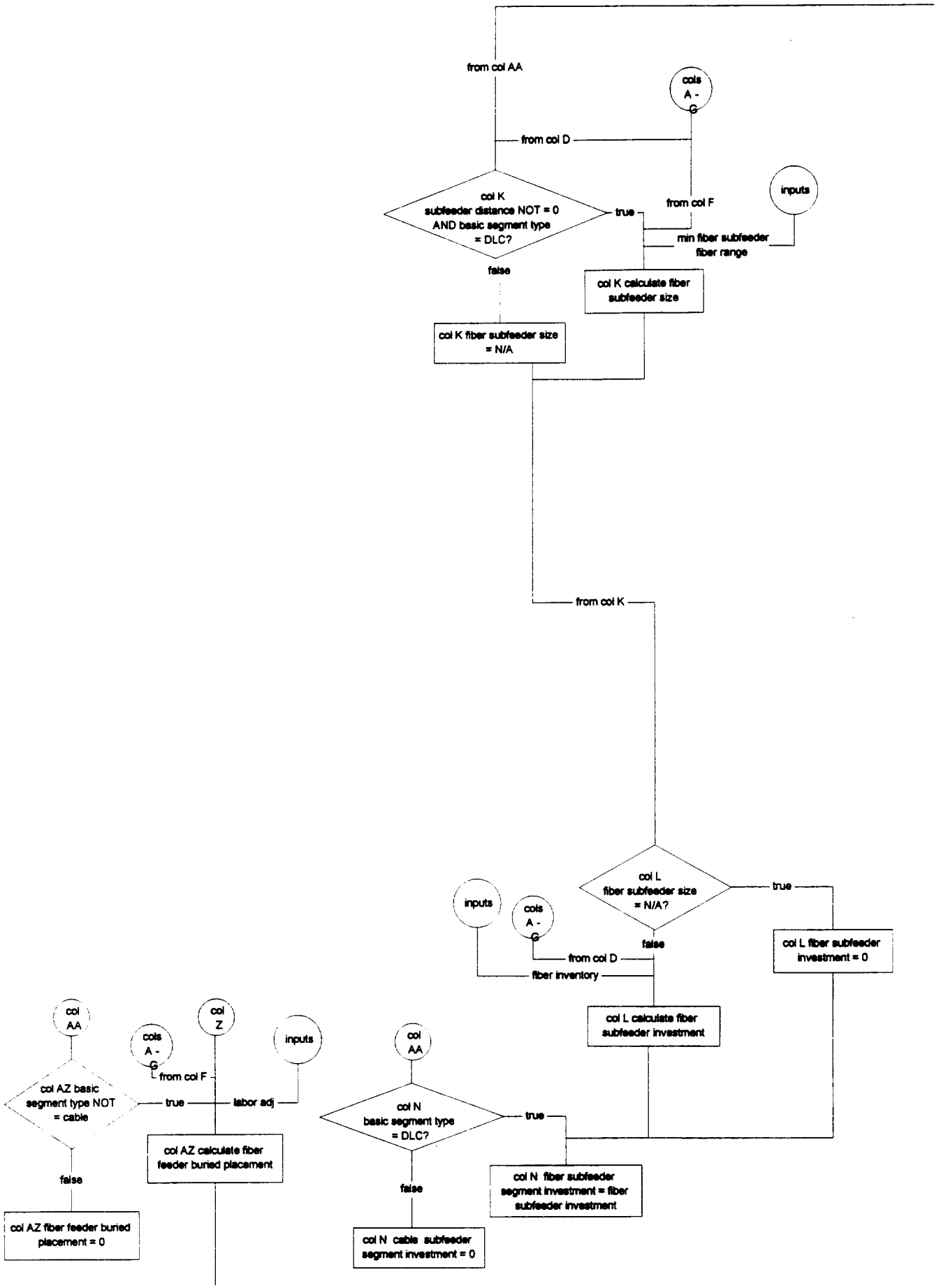

col Y
col AB
col AC
cols A - G
col AF basic segment = cable?
true
from cols B and E
false
col AF CBG sequence number = 1?
true
col Y
false
col AF next cumulative copper lines = 0
col AF calculate number of cumulative copper lines for next CBG
col AF next CBG sequence number = 1 OR next CBG sequence number not = to 1 AND basic segment type for this CBG not the same as the next CBG AND next quadrant not = to this quadrant AND secondary segment type is not cable OR the cumulative required copper pairs is blank?
true
false
col AF cumulative copper lines = basic lines
col AF cumulative copper lines = number of basic lines PLUS cumulative copper lines for next CBG
col AI
col AA
col AJ
inputs
col AH equipped feeder cable = 0 OR basic segment type = DLC?
false
max copper
from col AF
col AH calculate copper feeder fill
col AF
col I
col P cumulative copper lines = 0?
true
false
col P segment investment per line = 0
col P calculate segment investment per line
col P
col AR
col BC cumulative copper lines = 0?
true
false
col BC copper feeder conduit segment inv per line = 0
col BC calculate copper feeder conduit segment inv per line
col BC
col BD segment number = 1 OR cumulative conduit inv per line is text?
true
false
col BC
col BD cumulative conduit inv per line = copper feeder conduit segment inv per line
col BD calculate cumulative conduit inv per line
col AA
col BW
from col AM
cols A - G
inputs
from cols E, D and F
col BE basic segment type = cable?
true
basic lines, subfeeder dist, spare tubes sect, line density, conduit mat inv ft
false
col BE calculate assigned copper feeder conduit inv
col BE assigned copper feeder conduit inv = 0

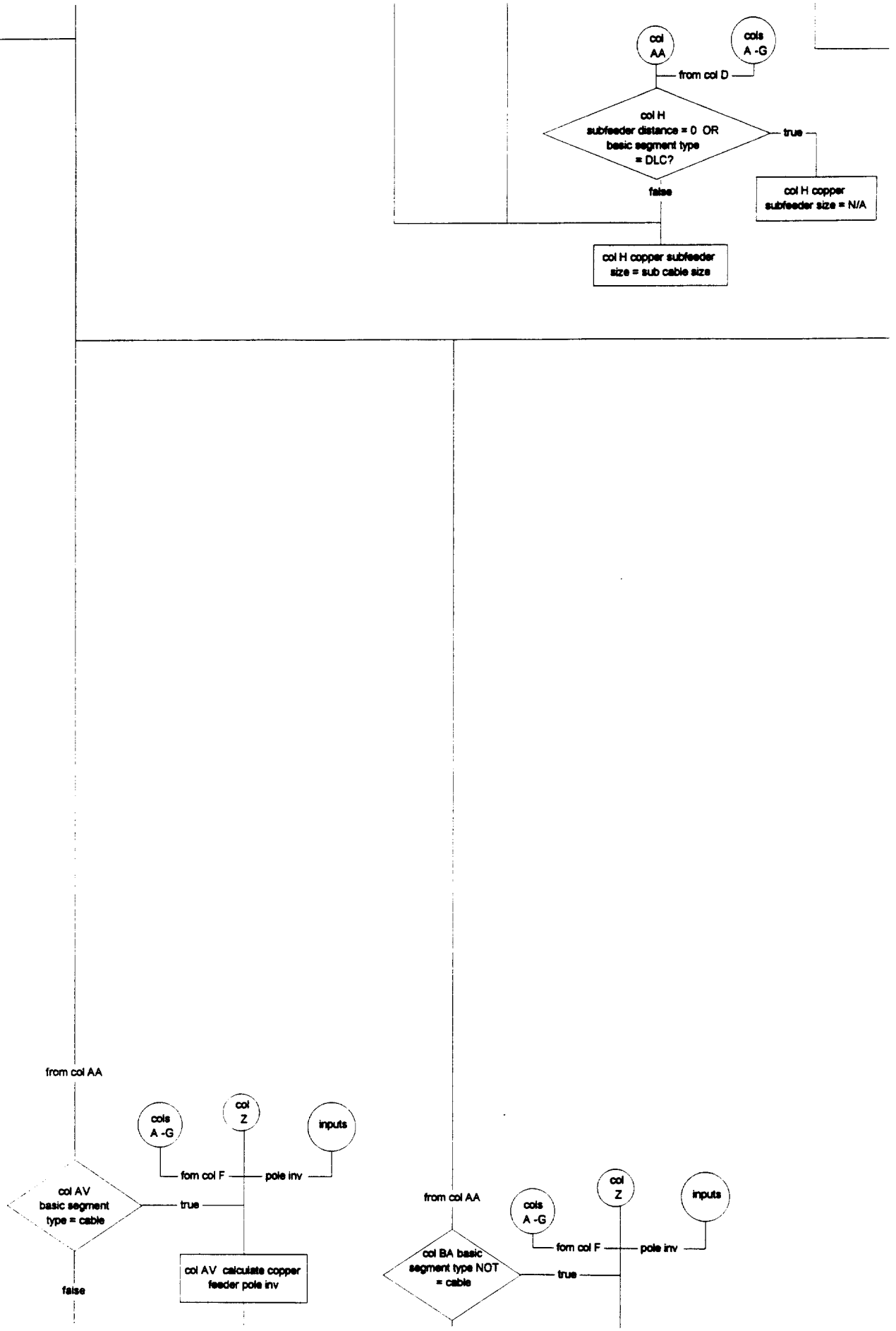

from col AD
col AE lines served by fiber = 0?
true
col AE total number of fiber strands = 0
false
col AE CBG sequence = 1?
true
col AE total number of fiber strands = strands required (col G2)
false
col AE number of lines served by fiber for this CBG = next CBG?
true
col AE total number of fiber strands for next CBG
false
col AE total number of fiber strands for this CBG
col AE
from col Y
cols A -G
from col C
col X CBG next sequence number = 1 OR is blank
true
col X calculate max distance using main feeder distance
false
col X calculate max distance using next max distance
col X
from col AA
true
col AH copper feeder fill = 0
col AK basic segment type = cable?
true
from cols E and F
col AM
cols A - G
false
col AK sub cable pairs = 0
col AK calculate sub cable pairs
inputs
cols A -G
from col F
col AN total number of fiber strands = 0?
true
col AN fiber cable size = 0
false
col AN calculate fiber cable size
col AN
inputs
max copper
col AM sub cable pairs greater than max copper?
true
col AM calculate max sub cables
false
col AM max sub cables = 0
col AM
col M total number of fiber strands = 0?
false
col M calculate fiber main segment investment
from col AK
col AL sub cable pairs NOT = 0?
true
false
col AL calculate sub cable size
col AL sub cable size = 0

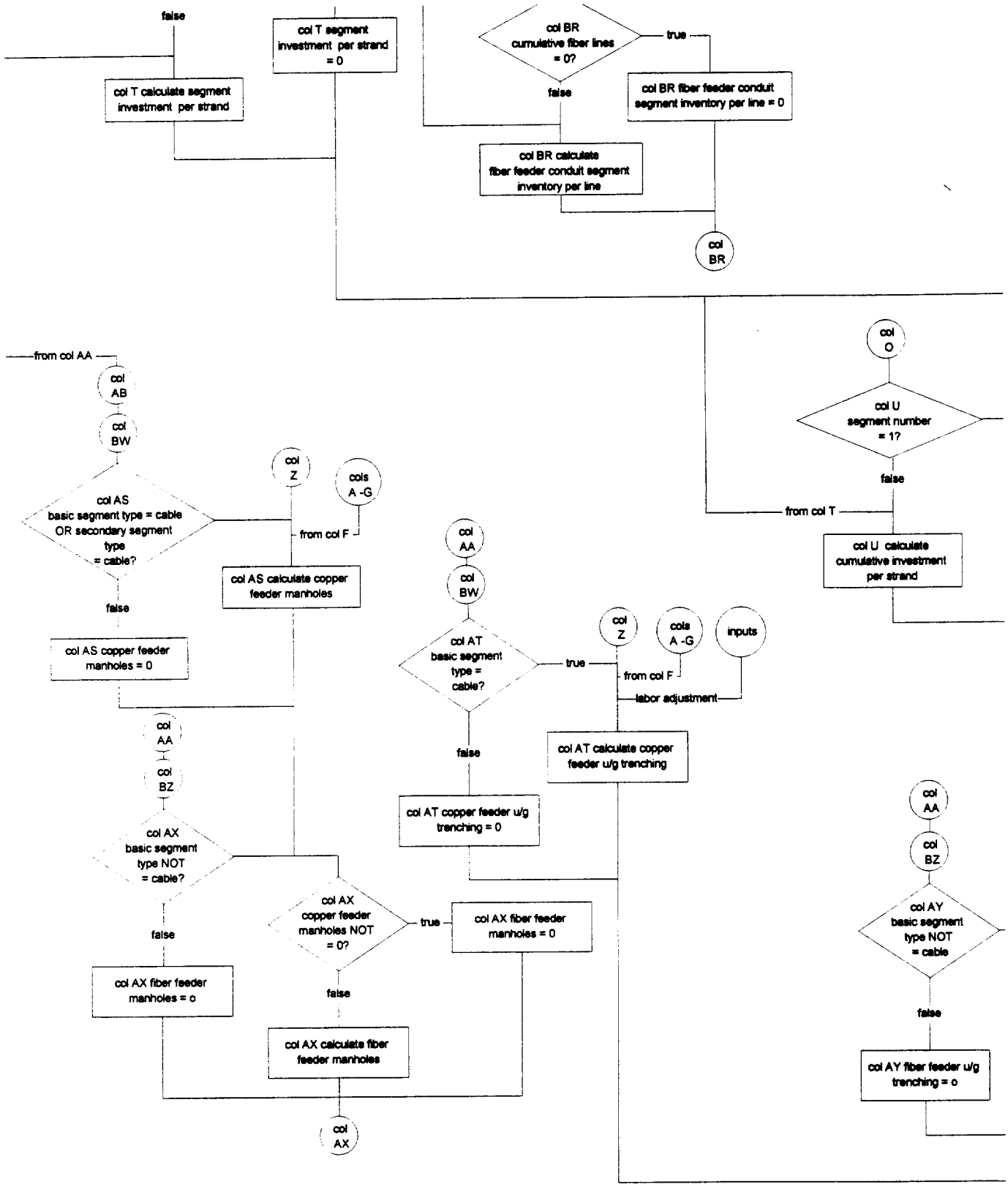

from col AB
col AA
col AQ basic segment type = DLC OR secondary segment type = DLC?
true
false
col AQ fiber segment total = 0
col AQ next CBG sequence number = 1 OR next basic segment type NOT = to DLC AND secondary segment type Not = to DLC?
true
false
col AQ fiber segment total = fiber segment cumulative distance
col AQ fiber segment total = next fiber segment total
col AQ
false
col AC calculate cumulative copper pairs for next CBG
col AC
col AI cumulative required copper pairs not = to 0?
false
col AI equipped feeder cable = 0
col AI
inputs
coppe
cols A -G
inputs
from col F
max fiber
col AO total number of fiber strands divided by line density is greater than maximum fiber?
true
false
col AO calculate max fiber cables
col AO max fiber cables = 0
col AA
col AB
col BZ
col AW basic segment type = cable AND secondary segment type not = to DLC?
true
col AW fiber feeder conduit inventory = 0
col AW fiber segment total = 0
true
col AW fiber feeder conduit inventory = 0
false
col AW calculate fiber feeder conduit inv
true
col Z
col AO
col AN
inputs
col M fiber main segment investment = 0
fiber inv and max fiber inv
col AE
col T total number fiber strands = 0?
true
col AG

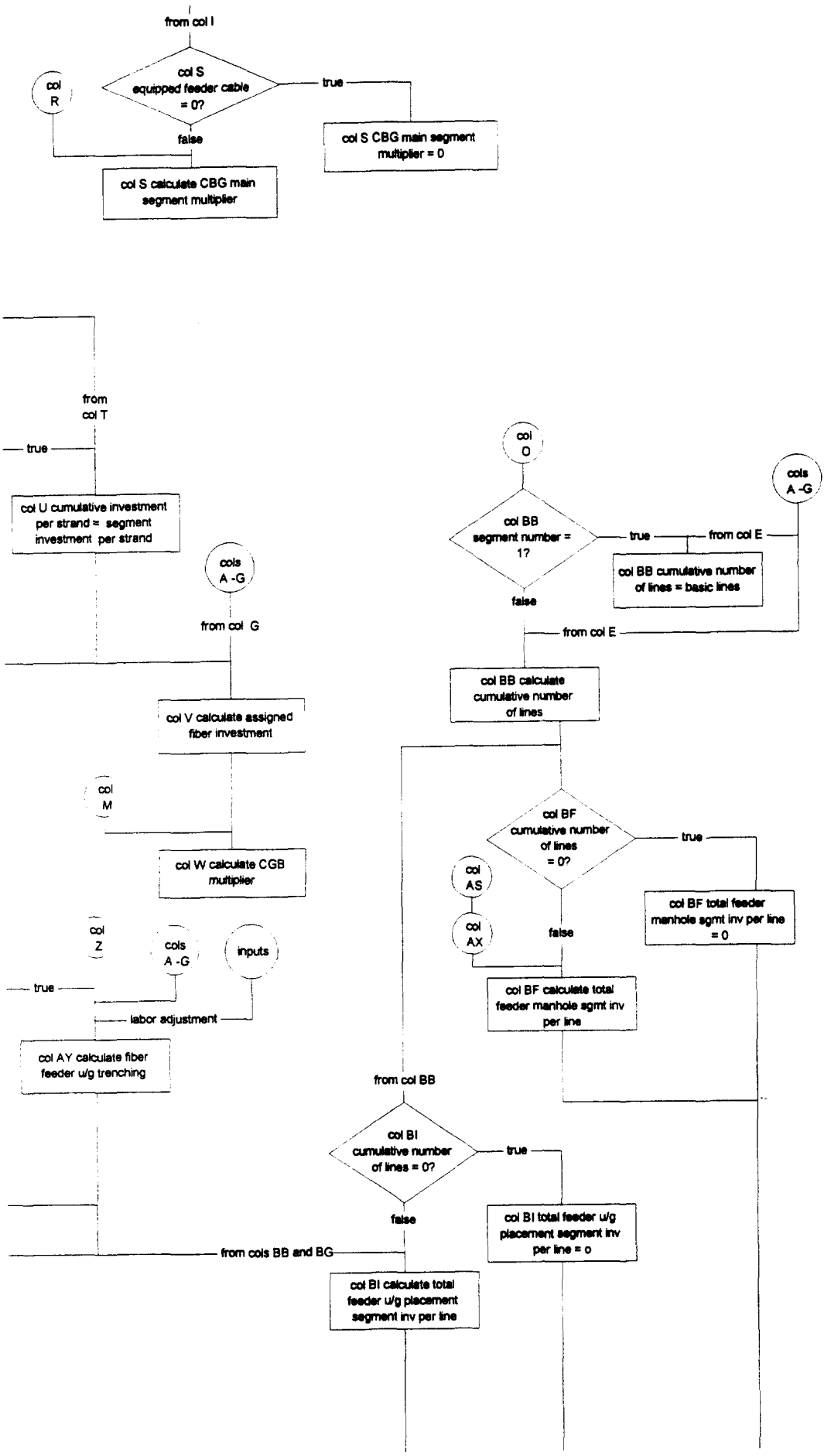

col AC cumulative copper pairs = 0
false
cols A - G
from col E
col AC calculate cumulative copper pairs for this CGB
col AC
inputs
max copper
col AJ cumulative number of copper pairs is greater than the max copper cable size?
true
col AJ calculate maximum number of main cables
false
col AJ maximum number of main cables = 0
true
inputs
copper range and max copper
col AJ
col AI calculate equipped feeder cable
col I equi pped feeder cable =0?
true
col Z
false
r inventory and labor adjustment
col I current segment investment = 0
col I calculate current segment investment
col I
col AA
col BT basic segment type = DLC?
true
col BS
cols A -G
from col E
false
col BT calculate assigned fiber feeder conduit inv PLUS
col BT return 0 PLUS
col BT basic segment type = cable?
true
col BT return 0
col AQ
false
col BT assigned feeder pole inventory = 0?
true
col BT return blank
inputs
cols A -G
col BW
false
from col D
conduit_mat_inv_ft, spare_tubes_sect
col BT calculate assigned fiber feeder conduit inv ADDITIONAL COSTS

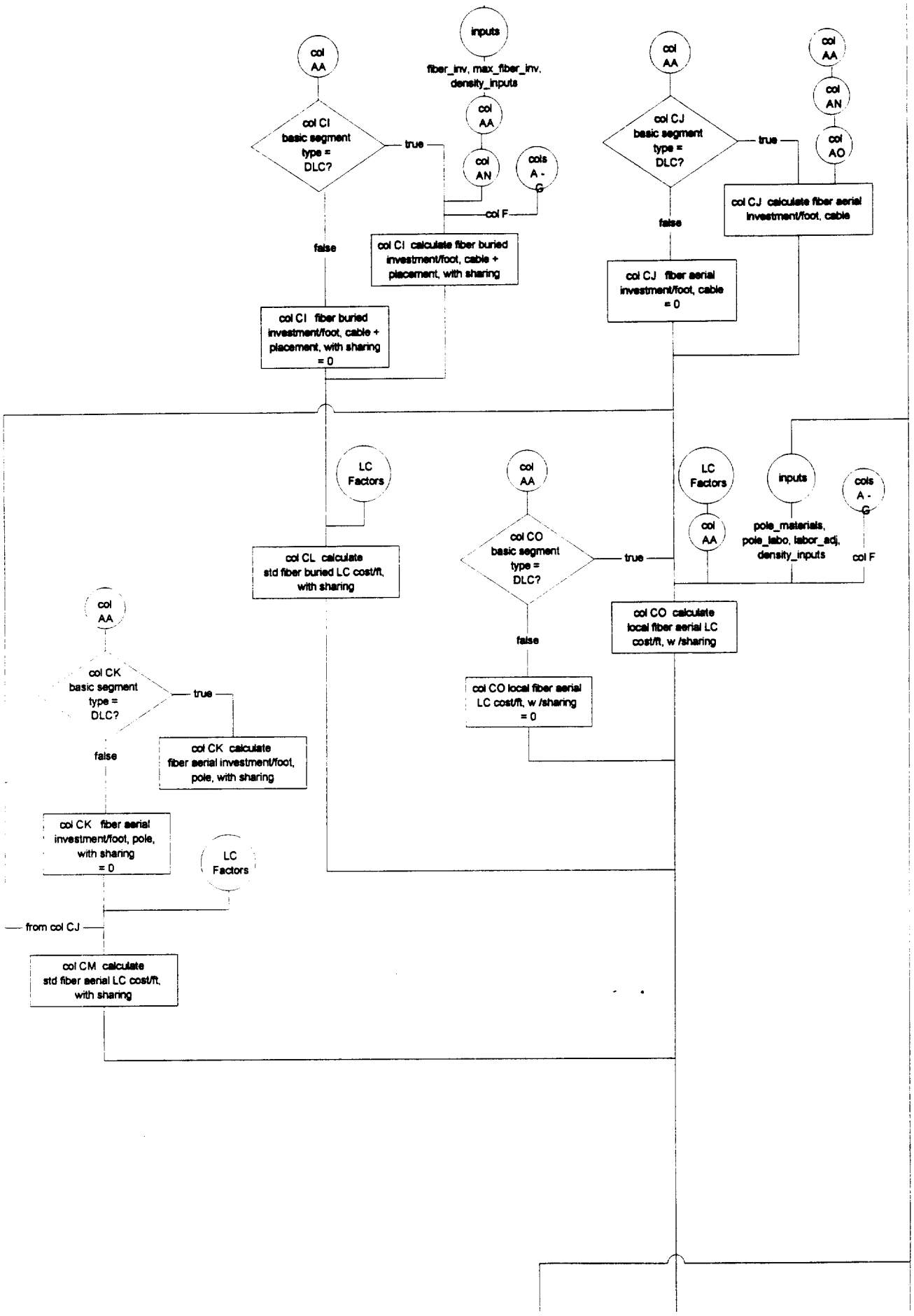

cols A - G
col F
inputs
max_copper_inv, copper_inv, labor_adj, density_inputs
col AA
col CF basic segment type = cable?
true
false
col AJ
col CF calculate local copper buried LC cost/ft, w/sharing MULTIPLIER
col CF local copper buried LC cost/ft, w/sharing = 0
LC Factors
col CF calculate local copper buried LC cost/ft, w/sharing
from cols CD, CE, CG
col AA
inputs
cols A - G
density_inputs
col F
col CH basic segment type = cable?
true
false
col CH calculate copper buried adjustment
col CH copper buried adjustment = 0
inputs
cols A - G
density_inputs
col F
col BU calculate effective copper buried fraction
col BW
col BU
col BV calculate effective copper serial fraction
col BV

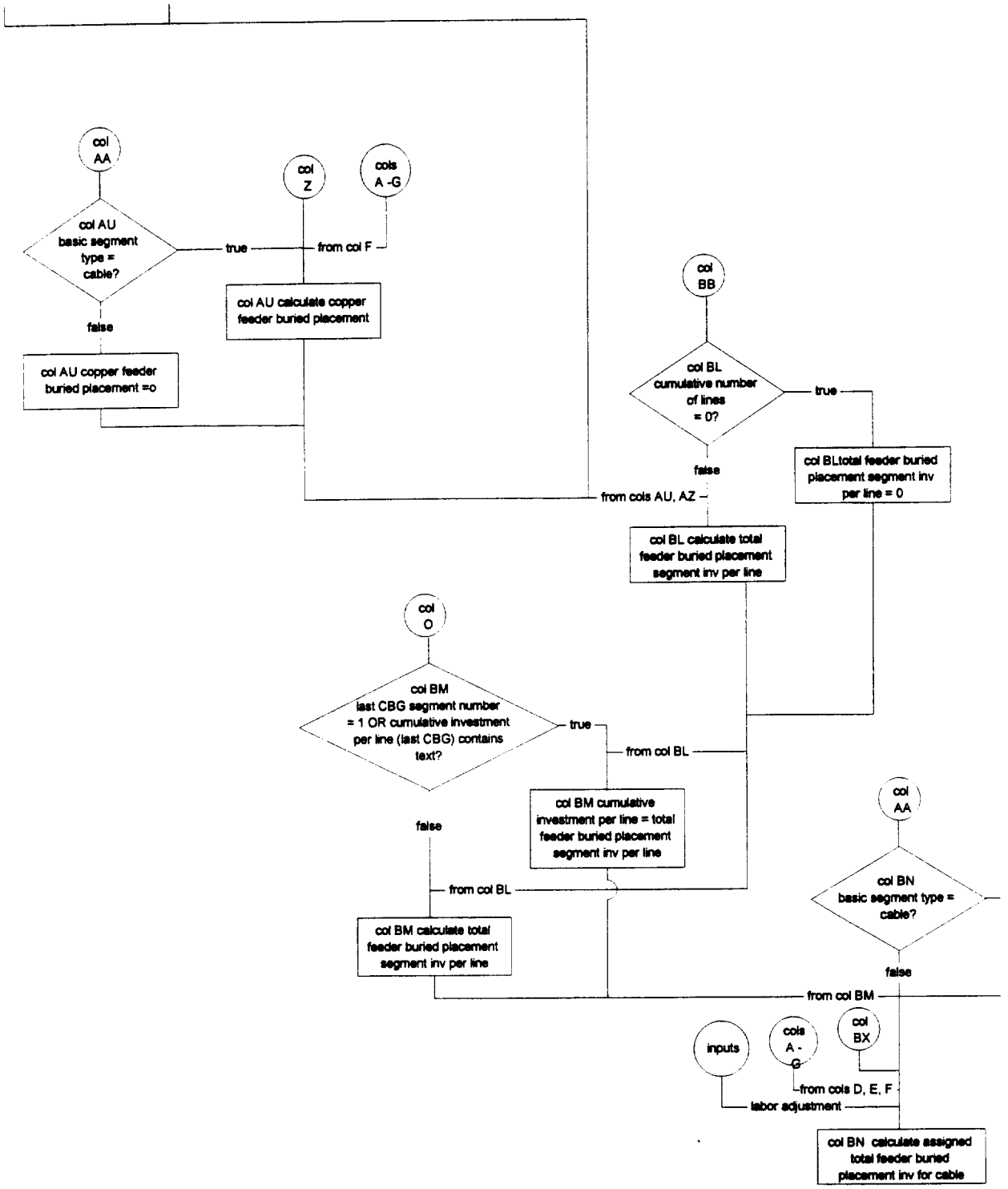

from col AA
cols A - G
from col D
col K subfeeder distance NOT = 0 AND basic segment type = DLC?
true
from col F
inputs
min fiber subfeeder fiber range
false
col K calculate fiber subfeeder size
col K fiber subfeeder size = N/A
from col K
col L fiber subfeeder size = N/A?
true
inputs
cols A - G
false
from col D
fiber inventory
col L fiber subfeeder investment = 0
col L calculate fiber subfeeder investment
col AA
cols A - G
col Z
inputs
col AA
from col F
col AZ basic segment type NOT = cable
true
labor adj
col N basic segment type = DLC?
true
col AZ calculate fiber feeder buried placement
false
col N fiber subfeeder segment investment = fiber subfeeder investment
false
col AZ fiber feeder buried placement = 0
col N cable subfeeder segment investment = 0

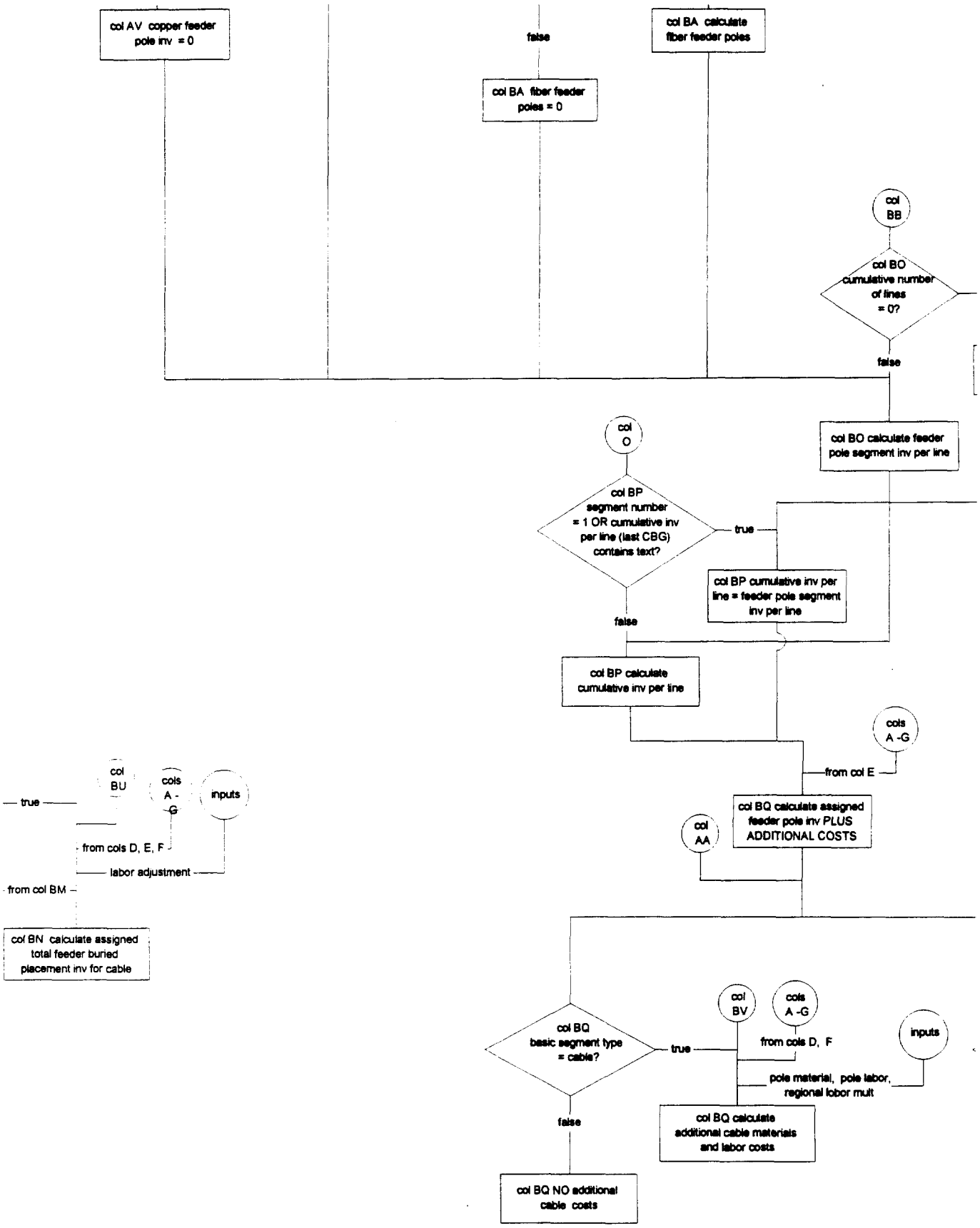

col AA
cols A -G
from col D
col H subfeeder distance = 0 OR basic segment type = DLC?
true
false
col H copper subfeeder size = N/A
col H copper subfeeder size = sub cable size
from col AA
cols A -G
col Z
inputs
fom col F
pole inv
col AV basic segment type = cable
true
false
col AV calculate copper feeder pole inv
from col AA
cols A -G
col Z
inputs
fom col F
pole inv
col BA basic segment type NOT = cable
true

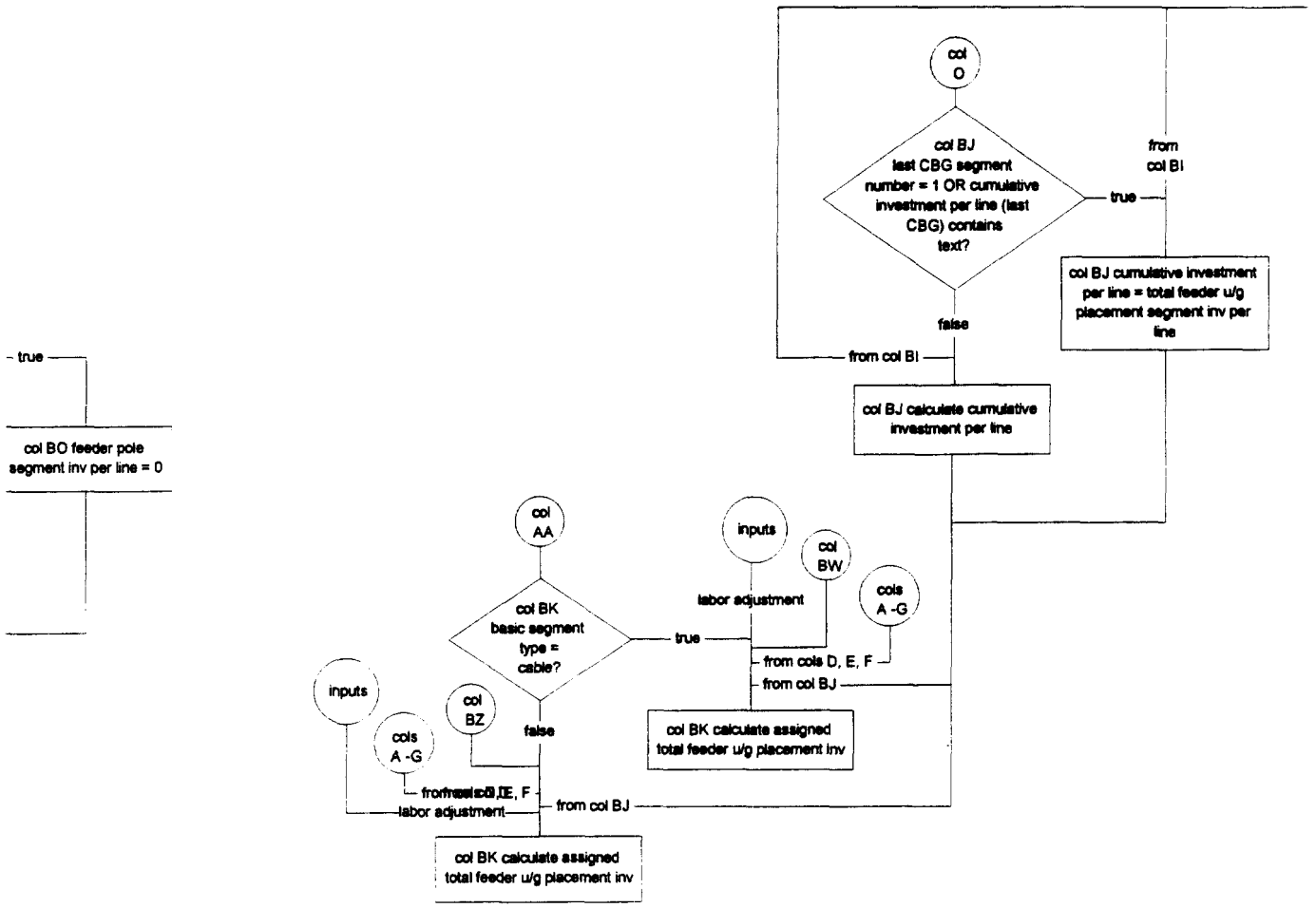

false
col T calculate segment investment per strand
col T segment investment per strand = 0
col BR cumulative fiber lines = 0?
true
false
col BR fiber feeder conduit segment inventory per line = 0
col BR calculate fiber feeder conduit segment inventory per line
col BR
col O
col U segment number = 1?
false
from col T
col U calculate cumulative investment per strand
from col AA
col AB
col BW
col AS basic segment type = cable OR secondary segment type = cable?
col Z
cols A -G
from col F
col AS calculate copper feeder manholes
false
col AS copper feeder manholes = 0
col AA
col BW
col AT basic segment type = cable?
true
col Z
cols A -G
inputs
from col F
labor adjustment
col AT calculate copper feeder u/g trenching
false
col AT copper feeder u/g trenching = 0
col AA
col BZ
col AX basic segment type NOT = cable?
false
col AX fiber feeder manholes = o
col AX copper feeder manholes NOT = 0?
true
col AX fiber feeder manholes = 0
false
col AX calculate fiber feeder manholes
col AX
col AA
col BZ
col AY basic segment type NOT = cable
false
col AY fiber feeder u/g trenching = o

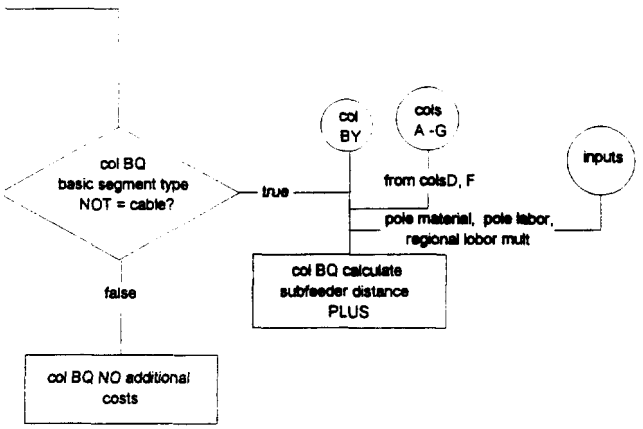

from col I
col R
col S equipped feeder cable = 0?
true
false
col S CBG main segment multiplier = 0
col S calculate CBG main segment multiplier
from col T
true
col U cumulative investment per strand = segment investment per strand
cols A -G
from col G
col V calculate assigned fiber investment
col M
col W calculate CGB multiplier
col Z
cols A -G
inputs
true
labor adjustment
col AY calculate fiber feeder u/g trenching
col O
col BB segment number = 1?
true
from col E
col BB cumulative number of lines = basic lines
false
cols A -G
from col E
col BB calculate cumulative number of lines
col BF cumulative number of lines = 0?
true
col BF total feeder manhole sgmt inv per line = 0
col AS
col AX
false
col BF calculate total feeder manhole sgmt inv per line
from col BB
col BI cumulative number of lines = 0?
true
col BI total feeder u/g placement segment inv per line = o
false
from cols BB and BG
col BI calculate total feeder u/g placement segment inv per line

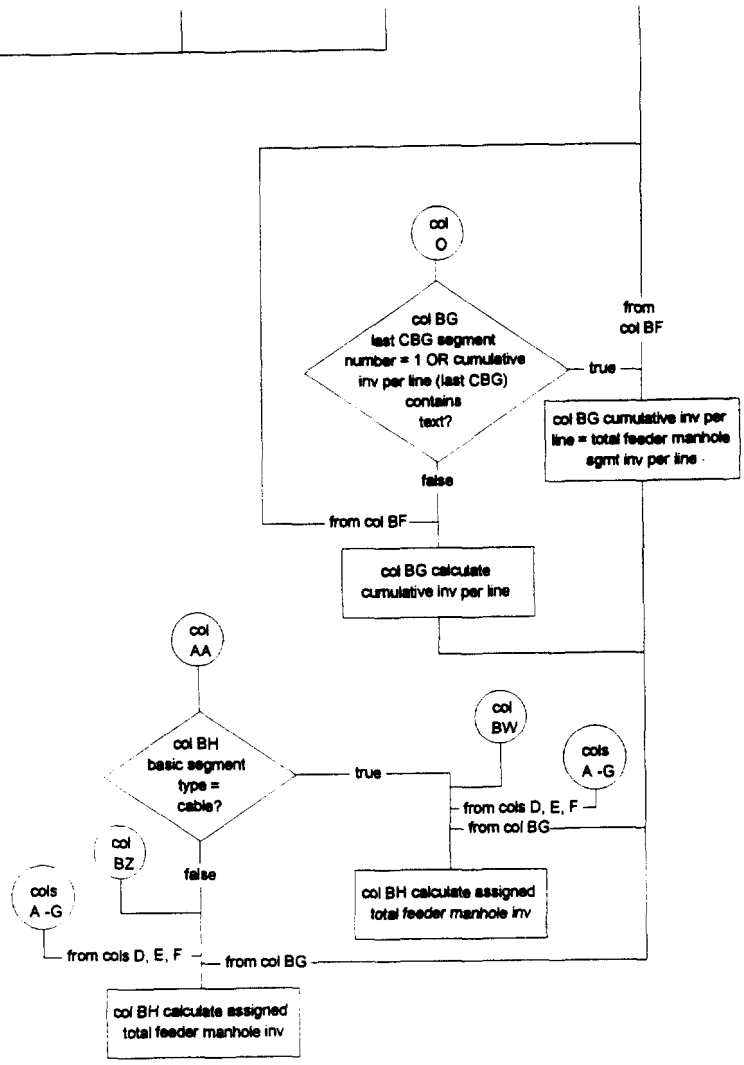

inputs
fiber_inv, max_fiber_inv, density_inputs
col AA
col AN
cols A - G
col F
col CI basic segment type = DLC?
true
false
col CI calculate fiber buried investment/foot, cable + placement, with sharing
col CI fiber buried investment/foot, cable + placement, with sharing = 0
col CJ basic segment type = DLC?
col AO
col CJ calculate fiber aerial investment/foot, cable
col CJ fiber aerial investment/foot, cable = 0
LC Factors
col CL calculate std fiber buried LC cost/ft, with sharing
col CO basic segment type = DLC?
pole_materials, pole_labo, labor_adj, density_inputs
col CO calculate local fiber aerial LC cost/ft, w /sharing
col CO local fiber aerial LC cost/ft, w /sharing = 0
col CK basic segment type = DLC?
col CK calculate fiber aerial investment/foot, pole, with sharing
col CK fiber aerial investment/foot, pole, with sharing = 0
from col CJ
col CM calculate std fiber aerial LC cost/ft, with sharing

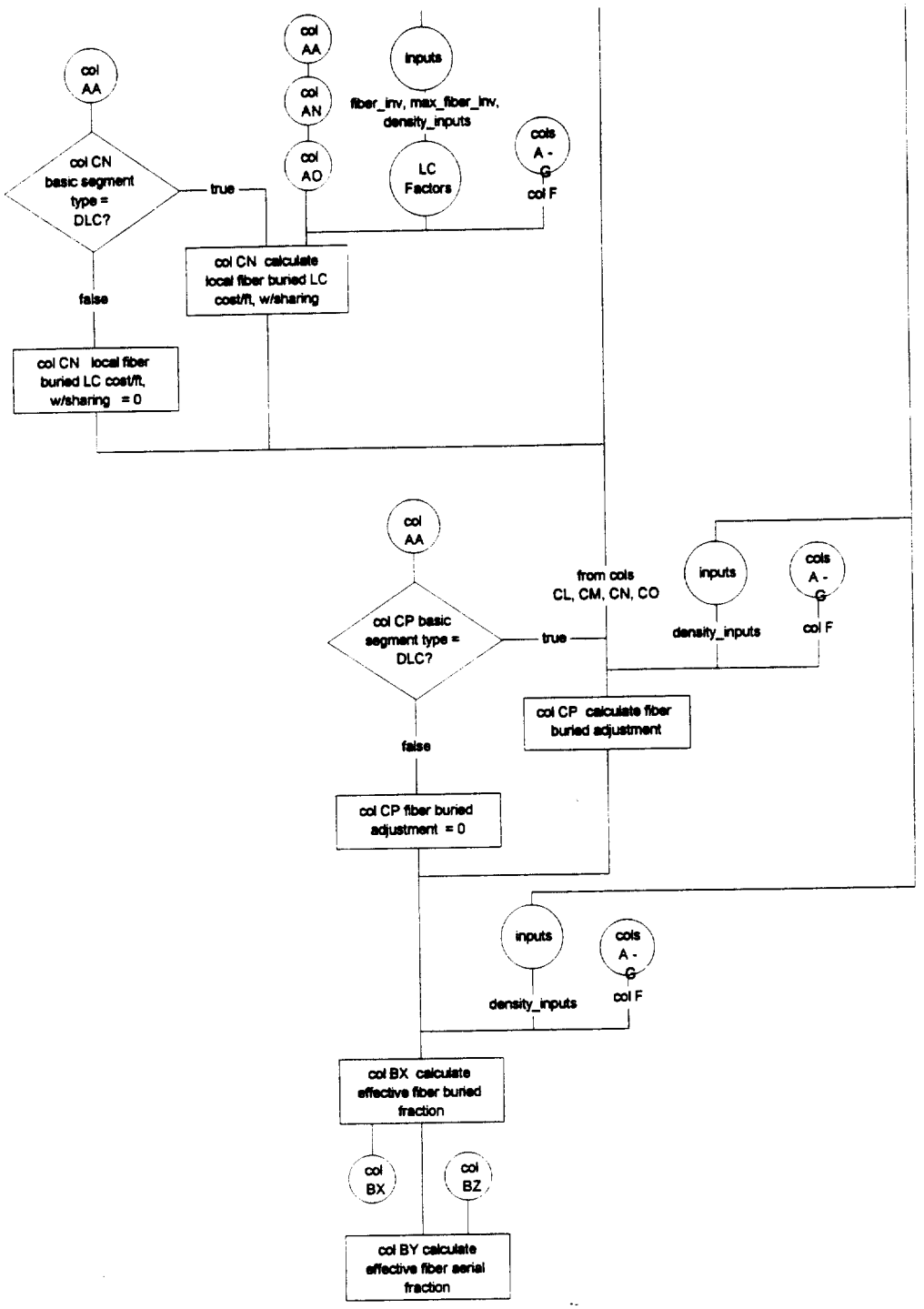

col AA
col AU basic segment type = cable?
true
false
col Z
cols A -G
from col F
col AU calculate copper feeder buried placement
col AU copper feeder buried placement =o
col BB
col BL cumulative number of lines = 0?
true
false
col BLtotal feeder buried placement segment inv per line = 0
from cols AU, AZ
col BL calculate total feeder buried placement segment inv per line
col O
col BM last CBG segment number = 1 OR cumulative investment per line (last CBG) contains text?
true
from col BL
col BM cumulative investment per line = total feeder buried placement segment inv per line
false
from col BL
col BM calculate total feeder buried placement segment inv per line
col AA
col BN basic segment type = cable?
false
from col BM
inputs
cols A - G
col BX
from cols D, E, F
labor adjustment
col BN calculate assigned total feeder buried placement inv for cable


col AV copper feeder pole inv = 0
false
col BA calculate fiber feeder poles
col BA fiber feeder poles = 0
col BB
col BO cumulative number of lines = 0?
false
col BO calculate feeder pole segment inv per line
col O
col BP segment number = 1 OR cumulative inv per line (last CBG) contains text?
true
col BP cumulative inv per line = feeder pole segment inv per line
false
col BP calculate cumulative inv per line
cols A -G
from col E
col BQ calculate assigned feeder pole inv PLUS ADDITIONAL COSTS
col AA
col BU
cols A - G
inputs
true
from cols D, E, F
labor adjustment
from col BM
col BN calculate assigned total feeder buried placement inv for cable
col BQ basic segment type = cable?
true
col BV
cols A -G
from cols D, F
inputs
pole material, pole labor, regional labor mult
col BQ calculate additional cable materials and labor costs
false
col BQ NO additional cable costs

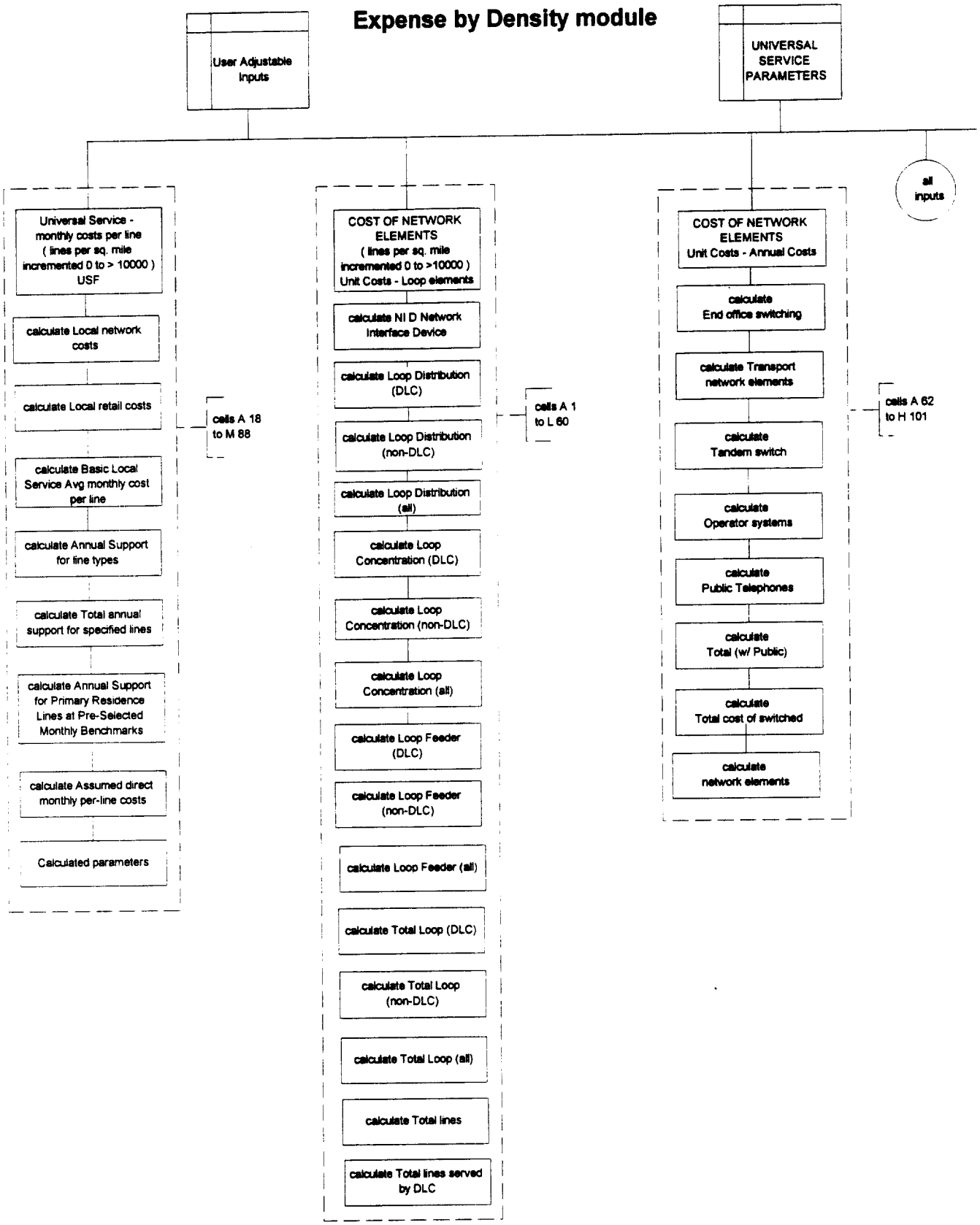

col O
col BJ last CBG segment number = 1 OR cumulative investment per line (last CBG) contains text?
true
from col BI
col BJ cumulative investment per line = total feeder u/g placement segment inv per line
false
from col BI
col BJ calculate cumulative investment per line
true
col BO feeder pole segment inv per line = 0
col AA
col BK basic segment type = cable?
true
inputs
labor adjustment
col BW
cols A -G
from cols D, E, F
from col BJ
col BK calculate assigned total feeder u/g placement inv
inputs
cols A -G
col BZ
false
from cols D, E, F
labor adjustment
from col BJ
col BK calculate assigned total feeder u/g placement inv


col BQ basic segment type NOT = cable?
true
col BY
cols A -G
from colsD, F
inputs
pole material, pole labor, regional lobor mult
col BQ calculate subfeeder distance PLUS
false
col BQ NO additional costs


col O
col BG last CBG segment number = 1 OR cumulative inv per line (last CBG) contains text?
true
from col BF
col BG cumulative inv per line = total feeder manhole sgmt inv per line
false
from col BF
col BG calculate cumulative inv per line
col AA
col BH basic segment type = cable?
true
col BW
cols A -G
from cols D, E, F
from col BG
col BZ
false
cols A -G
col BH calculate assigned total feeder manhole inv
from cols D, E, F
from col BG
col BH calculate assigned total feeder manhole inv


col AA
col CN basic segment type = DLC?
true
false
col CN calculate local fiber buried LC cost/ft, w/sharing
col CN local fiber buried LC cost/ft, w/sharing = 0
col AA
col AN
col AO
inputs
fiber_inv, max_fiber_inv, density_inputs
LC Factors
cols A - G
col F
col AA
col CP basic segment type = DLC?
true
false
from cols CL, CM, CN, CO
inputs
density_inputs
cols A - G
col F
col CP calculate fiber buried adjustment
col CP fiber buried adjustment = 0
inputs
density_inputs
cols A - G
col F
col BX calculate effective fiber buried fraction
col BX
col BZ
col BY calculate effective fiber aerial fraction

HM 4.0
Expense Density Zone
Module Flows

1	2	3
4	5	6

Expense by Density module