



**SPECIFICATION FOR PAYE TAX TABLE
ROUTINES FOR FREE OF TAX (FOT)
ARRANGEMENTS**

VERSION 4.0 ISSUED May 2017

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This specification is to be used only for Free of Tax arrangements.

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SPECIFICATION FOR PAYE TAX TABLE ROUTINES FOR FREE OF TAX (FOT) ARRANGEMENTS –VERSION 4.0 ISSUED – May 2017

<p>Version 3.0</p>	<p>Amendments have been included in this version to take into account the change to the 50% overriding Regulatory limit previously applied to K codes. From 6 April 2015 the 50% overriding Regulatory limit will be extended to all tax codes.</p>	<p>October 2014</p>
<p>Version 4.0</p>	<p>Amendments incorporated to include information about the Scottish tax codes, rates and bandwidths.</p> <p>Amendments have been made to the definitions of Pn and pn to include any payrolled benefits in kind. A new symbol has been introduced for payrolled benefits in kind in the current pay period which is used in the 50% overriding limit formulae.</p> <p>References to Tax Tables G, FOT1 and P11(FOT) have been removed. (Manual FOT products are no longer available.)</p>	<p>May 2017</p>

1. INTRODUCTION

- 1.1 This is the published Specification for computing PAYE tax where Free of Tax (FOT) arrangements are in place, and expands on the information contained in the "*Employer Further Guide to PAYE and NICs*" (CWG2) which can be downloaded from GOV.UK.
- 1.2 The calculation method remains unchanged by the introduction of Scottish rates and bandwidths but new Scottish equivalents have been introduced for some of the symbols/definitions.
- 1.3 Although the tax structure incorporates various rates and bandwidths such as the Basic, Higher and Additional for example these distinctions are mainly semantic, and for the purposes of paragraph 2 onwards of this Specification, the tax structure is treated as a uniform sequence of rates and associated bandwidths, in ascending order of rate.
- 1.4 Except where indicated, throughout this Specification, references to a week also refers to a month where relevant, and in such cases references to division by 52 or to Week 52 should be read as references to division by 12 or to Month 12 respectively.
- 1.5 In addition to the various technical specifications, the HM Revenue & Customs issues a series of "PAYE Updates", which are produced as circumstances warrant. Such updates are advisory only, and are used to give as much warning as possible of changes to the PAYE system. Formal instructions on changes however are issued direct to employers via *Basic PAYE Tools*, the *Employer Pack*, the *Employer Budget Pack* and the *Employer Bulletin*. The "PAYE Updates" are also used to publish amendments to the parameters used in this Specification, go to www.gov.uk/government/collections/software-developers-payee-updates

2. COMPUTERISED PAYE TAX ROUTINES - GENERAL

2.1 The routines that follow are necessarily complex, and where it has been considered an appropriate aid to clarity both a narrative and a mathematical version of the calculations has been given. The following symbols are used throughout the Specification and additional symbols are introduced in the Definitions given in paragraph 2.3. A glossary of the symbols is provided in Appendix C: new users particularly may find it helpful to detach this for ease of reference when reading later parts of the Specification.

2.2 Basic Symbols

<u>Description</u>	<u>Symbol</u>
Week number	n
Free of Tax Pay up to and including Week n (NB. lower case p)	p_n
Cumulative Free of Tax Pay up to and including Week n (NB. upper case P)	P_n
Free Pay for Week 1	a₁
Additional Pay for Week 1	e₁
Payrolled Benefits in Kind for week n (NB lower case p)	pbik
Cumulative Payrolled Benefits in Kind up to and including week n (NB upper case P)	Pbik
Nominal Taxable Pay up to and including Week n	
- before applying rounding rules	U_n
- after applying rounding rules	T_n
Tax deductible or refundable in Week n (NB. lower case l)	l_n
Tax liability up to and including Week n	L_n
True Gross Pay in Week n	tgpn
True Gross Pay up to and including Week n	TGP_n

2.3 Definition of terms

2.3.1 The various routines described later in this Specification make use of two distinct classes of parameters: Annual Constants whose values are supplied by HMRC and Weekly Constants derived from them for the current payroll run.

Only those items used in the tax calculations (shown in **bold** typeface) or in forming Weekly Constants (shown in *Italic* typeface) need be permanently held. The other Definitions are given

merely to show how the essential items are derived. Note that in order to avoid lengthy and unnecessary repetition, the listing of Definitions 1 to 7 and 10 to 12 inclusive which follows is incomplete, and has been terminated once the pattern has been established.

2.3.2 Annual and Weekly Constants. (The mathematical derivation and current values of the parameters symbolised generally at B, SB, BN, BNS, GC, GSC, K, SK, R and SR are given in Appendices A and B, as is the current value of the parameters G, G1, GD GD1 and M). The Practical Maximum Field Sizes recommended for the values of the Constants are:

B	99999	R	99.99%
SB	99999	SR	99.99%
BN	99999	G	9
BNS	99999	G1	9
GC	99999	GD	99
GSC	99999	GDS	99
K	99999.99	M	99.99%
SK	99999.99		

For all practical purposes the maximum values given in the Specification seem likely to be sufficient for several years. But the values will always have to be subject to change and when new programs are being developed, users may think it prudent to allow an extra £'s character for B, SB, BN, BNS, GC, GSC, K and SK.

2.3.3 Annual Constants - definitions

Symbol

Definition	1(a) Rate 1 = 1st rate of tax	R₁
"	1(b) Rate 2 = 2nd rate of tax	R₂
"	1(c) Rate 3 = 3rd rate of tax	R₃

And so on as necessary to accommodate the current range of **Rates** shown in Appendix A.

Definition	1.1(a) Scottish Rate 1 = 1st rate of tax	SR₁
"	1.1(b) Scottish Rate 2 = 2nd rate of tax	SR₂
"	1.1(c) Scottish Rate 3 = 3rd rate of tax	SR₃

And so on as necessary to accommodate the current range of **Rates** shown in Appendix B

Symbol

Definition	2(a) Bandwidth 1 = Annual bandwidth of 1st rate of tax	B1
"	2(b) Bandwidth 2 = Annual bandwidth of 2nd rate of tax	B2
"	2(c) Bandwidth 3 = Annual bandwidth of 3rd rate of tax	B3

And so on as necessary to accommodate the current range of Bandwidths shown in Appendix A.

Definition	2.1(a) Bandwidth 1 = Scottish Annual bandwidth of 1st rate of tax	SB1
"	2.1(b) Bandwidth 2 = Scottish Annual bandwidth of 2nd rate of tax	SB2
"	2.1(c) Bandwidth 3 = Scottish Annual bandwidth of 3rd rate of tax	SB3

And so on as necessary to accommodate the current range of Bandwidths shown in Appendix B.

Definition	3(a) Nominal Bandwidth 1 = Nominal bandwidth of 1st rate of tax	BN1
"	3(b) Nominal Bandwidth 2 = Nominal bandwidth of 2nd rate of tax	BN2
"	3(c) Nominal Bandwidth 3 = Nominal bandwidth of 3rd rate of tax	BN3

And so on as necessary to accommodate the current range of Nominal Bandwidths shown in Appendix A.

Definition	3.1(a) Nominal Bandwidth 1 = Nominal bandwidth (Scotland) of 1st rate of tax (Scotland)	BNS1
"	3.1(b) Nominal Bandwidth 2 = Nominal bandwidth (Scotland) of 2nd rate of tax (Scotland)	BNS2
"	3.1(c) Nominal Bandwidth 3 = Nominal bandwidth (Scotland) of 3rd rate of tax (Scotland)	BNS3

And so on as necessary to accommodate the current range of Nominal bandwidths (Scotland) shown in Appendix B.

Definition	4(a) <i>Cumulative nominal bandwidth 1</i> = Nominal bandwidth 1	GC1
"	4(b) <i>Cumulative nominal bandwidth 2</i> = The sum of Nominal bandwidths 1 and 2	GC2
"	4(c) <i>Cumulative nominal bandwidth 3</i> = The sum of Nominal bandwidths 1, 2 and 3	GC3

And so on as necessary to accommodate the current range of *Cumulative Nominal Bandwidths* shown in Appendix A.

			<u>Symbol</u>
Definition	4.1(a) <i>Cumulative nominal bandwidth 1 (Scotland)</i>	= Nominal Bandwidth 1 (Scotland)	GSC₁
"	4.1(b) <i>Cumulative nominal bandwidth 2 (Scotland)</i>	= The sum of Nominal Bandwidths 1 and 2 (Scotland)	GSC₂
"	4.1(c) <i>Cumulative nominal bandwidth 3 (Scotland)</i>	= The sum of Nominal Bandwidths 1,2 and 3 (Scotland)	GSC₃

And so on as necessary to accommodate the current range of *Cumulative Nominal Bandwidths(Scotland)* shown in Appendix B.

Definition	5(a) Annual tax 1 = Bandwidth 1 x Rate 1	-
"	5(b) Annual tax 2 = Bandwidth 2 x Rate 2	-
"	5(c) Annual tax 3 = Bandwidth 3 x Rate 3	-

And so on as necessary to accommodate the current range of Bandwidths shown in Appendix A

"	5.1(a) Annual Tax 1 (Scotland) = Bandwidth 1 x Scottish Rate 1	-
"	5.1(b) Annual Tax 2 (Scotland) = Bandwidth 2 x Scottish Rate 2	-
"	5.1(c) Annual Tax 3 (Scotland) = Bandwidth 3 x Scottish Rate 3	-

And so on as necessary to accommodate the current range of Bandwidths shown in Appendix B

Definition	6(a) <i>Cumulative annual tax 1</i> = Annual tax 1	K₁
"	6(b) <i>Cumulative annual tax 2</i> = The sum of Annual taxes 1 and 2	K₂
"	6(c) <i>Cumulative annual tax 3</i> = The sum of Annual taxes 1, 2 and 3	K₃

And so on as necessary to accommodate the current range of *Cumulative annual taxes* shown in Appendix A.

	<u>Symbol</u>
Definition 6.1(a) <i>Cumulative Annual Tax 1</i> = Annual tax 1 (Scotland) (Scotland)	SK1
“ 6.1(b) <i>Cumulative Annual Tax 2</i> = The sum of Annual (Scotland) taxes 1 and 2 (Scotland)	SK2
“ 6.1(c) <i>Cumulative Annual Tax 3</i> = The sum of Annual (Scotland) taxes 1, 2 and 3 (Scotland)	SK3

And so on to accommodate the current range of *Cumulative Annual Taxes* shown in Appendix B

Definition 7(a) Grossing denominator 1	gd1
“ 7(b) Grossing denominator 2	gd2
“ 7(c) Grossing denominator 3	gd3

And so on to accommodate the current range of Grossing denominators shown in Appendix A

Definition 7.1(a) Grossing denominator 1(Scotland)	gds1
“ 7.1(b) Grossing denominator 2(Scotland)	gds2
“ 7.1(c) Grossing denominator 3(Scotland)	gds3

And so on to accommodate the current range of Grossing denominators shown in Appendix B

Definition 8 Gpointer Pointer to Basic Rate	G
Definition 8.1 G Pointer (Scotland) Pointer to Basic Rate (Scotland)	G1
Definition 9 GD Pointer Pointer to Basic Rate grossing denominator	GD
Definition 9.1 GD Pointer (Scotland) Pointer to Basic Rate (Scotland) grossing denominator	GDS
Definition 10 Not used	
Definition 11 Not used	

No rounding rules are necessary for the above Definitions 1 to 9. Definitions 8, 8.1, 9 and 9.1 are a single value for the year and so unlike all other previous Definitions are not representative of a range of similar items.

2.3.4 Weekly Constants - definitions

Symbol

Definition 12 (a)	Threshold 1 = $\frac{\text{Cumulative nominal}}{\text{bandwidth 1}} \times \frac{n}{52}$	Gc1
"	(b) Threshold 2 = $\frac{\text{Cumulative nominal}}{\text{bandwidth 2}} \times \frac{n}{52}$	Gc2
"	(c) Threshold 3 = $\frac{\text{Cumulative nominal}}{\text{bandwidth 3}} \times \frac{n}{52}$	Gc3

And so on as necessary to accommodate the current range of *Cumulative nominal bandwidths* shown in Appendix A.

Definition 12.1(a)	Threshold 1 (Scotland) = $\frac{\text{Cumulative nominal}}{\text{bandwidth 1(Scotland)}} \times \frac{n}{52}$	GSc1
"	(b) Threshold 2 (Scotland) = $\frac{\text{Cumulative nominal}}{\text{bandwidth 2(Scotland)}} \times \frac{n}{52}$	GSc2
"	(c) Threshold 3 (Scotland) = $\frac{\text{Cumulative nominal}}{\text{bandwidth 3(Scotland)}} \times \frac{n}{52}$	GSc3

And so on as necessary to accommodate the current range of *Cumulative nominal bandwidths (Scotland)* shown in Appendix B.

Take the calculations for Definition 12 and 12.1 to 4 decimal places of a pound without applying any correction to the final place.

Definition 13(a)	GC value 1 = Threshold 1 } }Calculated as above	Gv1
"	13(b) GCvalue 2 = Threshold 2 }rounded if necessary }to nearest £1 above	Gv2
"	13(c) GCvalue 3 = Threshold 3 }	Gv3

And so on as necessary to accommodate the current range of **Thresholds**, (see Definition 12).

Definition 13.1(a)	GSC value 1 = Threshold 1 (Scotland) }Calculated as above	GSv1
"	13.1(b) GSCvalue 2 = Threshold 2 (Scotland) }rounded if necessary }to nearest £1 above	GSv2
"	13.1(c) GSCvalue 3 = Threshold 3 (Scotland) }	GSv3

And so on as necessary to accommodate the current range of **Thresholds (Scotland)**, (see Definition 12.1).

Symbol

Definition	14(a) Threshold tax 1 = $Cumulative\ annual\ tax\ 1 \times \frac{n}{52}$	k₁
"	14(b) Threshold tax 2 = $Cumulative\ annual\ tax\ 2 \times \frac{n}{52}$	k₂
"	14(c) Threshold tax 3 = $Cumulative\ annual\ tax\ 3 \times \frac{n}{52}$	k₃

And so on as necessary to accommodate the current range of *Cumulative annual taxes* shown in Appendix A

Definition	14.1(a) Threshold tax 1 = $Cumulative\ Annual\ Tax\ 1 \times \frac{n}{52}$ (Scotland) (Scotland)	Sk₁
"	14.1(b) Threshold tax 2 = $Cumulative\ Annual\ Tax\ 2 \times \frac{n}{52}$ (Scotland) (Scotland)	Sk₂
"	14.1(c) Threshold Tax 3 = $Cumulative\ Annual\ Tax\ 3 \times \frac{n}{52}$ (Scotland) (Scotland)	Sk₃

And so on as necessary to accommodate the current range of *Cumulative Annual Taxes* shown in Appendix B

Take the calculations for Definition 14 to 4 decimal places of a pound without applying any correction to the final place.

Definition 15	Maxrate	Maximum percentage tax deductible. (Also referred to as the overriding Regulatory limit)	M
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Definition 15 is a single value.

3. COMPUTERISED PAY TAX ROUTINES - CUMULATIVE SUFFIX CODES AND CUMULATIVE PREFIX K, SK CODES - EMPLOYEES PAID WEEKLY OR MONTHLY

3.1. The routine will pass through the stages summarised immediately below, and dealt with in detail thereafter.

- Stage 1 Calculation of Cumulative FOT Pay to date.
- Stage 2 Calculation of Nominal Taxable Pay to date.
- Stage 3 Calculation of tax due to date.
- Stage 4 Calculation of True Gross Pay to date.
- Stage 5 Calculation of True Gross Pay for the week.
- Stage 6 Calculation of tax deduction or refund for the week.

3.2 Stage 1 Calculation of Cumulative FOT Pay to date.

3.2.1 There are no complications here. Merely add the FOT pay for the week to the cumulative figure of FOT pay to date for the previous week to give a new cumulative figure of FOT pay to date. A definition of what constitutes pay for this purpose is given in the *Employer Further Guide to PAYE and NICs(CWG2)*. There is no rounding at this stage.

Expressed mathematically, $P_n = P_{(n-1)} + p_n$

3.3 Stage 2 Calculation of Nominal Taxable Pay to date

3.3.1 This is done by taking the Cumulative FOT Pay to date of Stage 1, adding the value of any Cumulative Payrolled Benefits in Kind, and either subtracting the Free Pay for the week for ordinary suffix codes or adding the Additional Pay for the week for Prefix K and SK codes. The value of either Free Pay or Additional Pay for Week **n** is simply **n** times the value for Week 1. A look-up table of Week 1 values may be held, or the values may be calculated from the numeric part of the codes as follows:

a. Numeric part of code is 0. Value for Week 1 is 0.

b. Numeric part of code is in range 1-500 inclusive. First calculate the annual value which is [(numeric part of code) x £10] + £9. Divide the annual value by 52, and if not already an exact multiple of 1p, round up the answer to the nearest multiple of 1p above to give the value for Week 1.
(Note: Calculate initially to 4 decimal places of a pound without applying any correction to the final place and round up if necessary to the nearest 1p above).

It can be seen that ordinary suffix code 1 thus represents annual allowances (Free Pay) of £19. As the next smaller suffix code is 0, representing an annual allowance of zero, suffix code 1 caters for annual allowances of £1-£19 inclusive, whereas all higher suffix codes cover an annual allowance range of only £10. Each Prefix K, or SK code represents an annual negative allowance (Additional Pay) of £10. There is no code K0, or SK0 and annual negative allowances in the range -£1 to -£19 are allocated code 0T or S0T.

c. Numeric part of code EXCEEDS 500. The value for Week 1 is obtained by adding 2 or more values calculated as follows:

- i. divide the code by 500. Note the quotient and remainder (e.g. for code 1567, the quotient is 3, that is 500 divides into 1567 three times, leaving a remainder of 67).
- ii. If the remainder is 0, deduct 1 from the quotient and set the remainder to 500 (e.g. for code 1500, the quotient is 3 and the remainder is 0. Set the quotient to 2 and the remainder to 500).

(NB. As a result of i. and ii. above, the quotient must be at least 1 and the remainder in the range 1 to 500 inclusive.)

- iii. The value (of either Free Pay or Additional Pay) for the remainder is calculated as for a code of 1 to 500 in paragraph 3.3.1b above.
- iv. The value (of either Free Pay or Additional Pay) for the balance of the code is:

For Week 1 - quotient x £96.16*
For Month 1 - quotient x £416.67*

*Note: These figures, which may be held as constants, are calculated as follows:

$(500 \times £10 \div 52 \text{ (rounded to 1p above)}) = £ 96.16$
 $(500 \times £10 \div 12 \text{ (rounded to 1p above)}) = £416.67$

- v. The component values calculated as iii. and iv. above - which have already been rounded - are then added together as the final stage. (NB. It is stressed that the correct action at i. and ii. above will ensure that there are always values other than 0 calculated at iii. and iv. above to be added together.)

Note for programmers. The full explanation above has been given for purposes of clarity. However, the method of breaking down the code number into multiples of 500 and a remainder described in paragraph 3.3.1c i. and ii, can also be achieved by:

- subtract 1 from code
- divide the result by 500
- note the quotient and remainder
- add 1 to the remainder
- calculate the Free Pay or Additional Pay for the remainder and balance of code as in paragraph 3.3.1c i and iv.

This alternative calculation can also be applied to codes in the range 1-500 inclusive, thus further simplifying the programming required. (The quotient will, of course, be 0 in these cases.)

3.3.2 The Week 1 value already being a multiple of 1p, no further rounding rule is necessary after multiplication by the week number, to give the value of Free Pay or Additional Pay for the week.

Taxable Pay to date is then calculated by either:-

- a. subtracting Free Pay for the week from Cumulative Pay to date for ordinary suffix codes, or
- b. adding Additional Pay for the week to Cumulative Pay to date for prefix K and SK codes and
- c. adding the value of any Cumulative Payrolled Benefits in Kind to date

Mathematically, FOR SUFFIX CODES, $U_n = P_n + P_{bik} - na1$

Mathematically, FOR PREFIX K, SK CODES, $U_n = P_n + P_{bik} + ne1$

3.3.3 For ordinary SUFFIX CODES since Nominal Taxable Pay to date is simply the excess of Cumulative FOT Pay to date plus Cumulative Payrolled Benefits in Kind over the Free Pay for the week, it follows that an individual has no liability to tax to date if the Free Pay for the week equals or exceeds the Cumulative FOT Pay plus the Cumulative Payrolled Benefits in Kind to date. In such cases Stage 3 following is not relevant, and the calculation can go directly to Stage 4.

Mathematically, FOR SUFFIX CODES

since $U_n = P_n + P_{bik} - na1$

if $na1 \geq (P_n + P_{bik})$ then $U_n \leq 0$

In such a case $L_n = 0$

and it follows that in cases going through Stage 3, $U_n > 0$

FOR PREFIX K, SK CODES, all cases will proceed to Stage 3 since U_n will always be positive.

3.3.4 Having determined a figure of Nominal Taxable Pay to date this stage is required to determine which calculation of tax due to date should be applied. To do this the routine must identify whether or not a Scottish rate is applicable.

FOR SUFFIX AND PREFIX K CODES CONTAINING NO 'S' IDENTIFIER, the routine must take the figure of Nominal Taxable Pay to date and apply the **Income Test 1**

FOR SUFFIX AND PREFIX K CODES CONTAINING THE 'S' IDENTIFIER, the routine must take the figure of Nominal Taxable Pay to date and apply the **Income Test 1(S)**.

3.4 Stage 3 Calculation of tax due to date.

3.4.1 This is the most complex stage of all. The routine must take the figure of Nominal Taxable Pay to date from Stage 2, and test to see at which rate(s) of tax it is liable. If the Nominal Taxable Pay to date exceeds the proportion of the first rate annual bandwidth that has accrued to date, then the routine must identify which of the remaining rate bands have had their proportions accrued to date fully utilised. This process identifies the top rate of liability for the week, provides figures for calculating tax on the fully utilised rate bands, and also gives the balance of the Nominal Taxable Pay to date left to be charged at the top rate of liability that has been determined.

3.4.2 To achieve this use is made of the Annual and Weekly Constants defined in paragraphs 2.3.3 and 2.3.4. The actual tax calculation for an individual then consists of two operations. The first uses one of the Weekly Constants to ascertain the top rate of liability for the week, and hence determine the relevant Tax Formula. The second operation takes this Tax Formula and makes use of other Annual and Weekly Constants to calculate the tax due to date.

3.4.3 Determination of the correct Tax Formula uses the figure of Nominal Taxable Pay to date (U_n) from Stage 2, and the **GC or GSC values** provided by Definition 11 of the Weekly Constants. The narrative descriptions of the Income Tests below are immediately followed in brackets by their mathematical descriptions. In order to avoid lengthy and unnecessary repetition, the list of Income Tests which follows is incomplete, and has been terminated once the pattern has been established.

Note: The routine must apply the following Income Tests depending on whether or not a Scottish rate is applicable:

Income Test 1 – for suffix and prefix K codes containing no ‘S’ identifier.

Income Test 1(S) – for suffix and prefix K codes containing the ‘S’ identifier

Income Test 1 Is Nominal Taxable Pay to date less than or equal to **GC value 1?**

(Is $U_n \leq Gv_1$?) If yes, use Tax Formula 1.
If no, consider Income Test 2.

Income Test 1(S) Is Nominal Taxable Pay to date less than or equal to **GSC value 1?**

(Is $U_n < GSv_1$?) If yes, use Tax Formula 1(S)
If no, consider Income Test 2(S)

Income Test 2 Is Nominal Taxable Pay to date less than or equal to **GC value 2?**

(Is $U_n \leq Gv_2$?) If yes, use Tax Formula 2.
If no, consider Income Test 3.

Income Test 2(S) Is Nominal Taxable Pay to date less than or equal to **GSC value 2?**

(Is $U_n < GSv_2$?) If yes, use Tax Formula 2(S)
If no, consider Income Test 3(S)

and so on, up to

Income Test x Is Nominal Taxable Pay to date less than or equal to **GCvalue (x)**?
 (Is $U_n \leq G_{v(x)}$?) If yes, use Tax Formula x.
 If no, use Tax Formula x +1

where x = number of Nominal Bandwidths currently shown in Appendix A

Income Test x(S) Is Nominal Taxable Pay to date less than or equal to **GSC value(x)**?
 (Is $U_n < G_{Sv(x)}$?) If yes, use Tax Formula x
 If no, use Tax Formula x + 1(S)

where x = number of Nominal Bandwidths (Scotland) currently shown in Appendix B

Note that Income Tests x and x(S) have a different consequence to all the preceding ones, if the test should fail.

3.4.4. Having determined the relevant Tax Formula, where the figure of Nominal Taxable Pay to date (U_n) is not already an exact multiple of £1 for the purpose of calculating tax it should now be rounded down to the nearest pound below. This rounded figure of Nominal Taxable Pay to date (T_n) is then used in the relevant Tax Formula.

The narrative descriptions of the Tax Formulae are followed by their mathematical descriptions. Note that in order to avoid lengthy and unnecessary repetition, the list of Tax Formulae which follows is incomplete, and has been terminated once the pattern has been established.

Tax Formula 1 Tax to date = Tax at **Rate 1** on Nominal Taxable pay to date, multiplied by the grossing factor (100 divided by grossing denominator 1) for **Rate 1**

$$L_n = T_n R_1 (100 \div gd_1)$$

Note: This Tax Formula may be expressed in the same style as all subsequent Tax Formulae, provided 2 additional parameter values (k_0 and Gc_0) are included in the system, both always taking value zero. Thus

$$L_n = k_0 + [(T_n - Gc_0) R_1 (100 \div gd_1)]$$

Tax Formula 1(S) Tax to date = Tax at **Scottish Rate 1** on Nominal Taxable pay to date, multiplied by grossing fraction (100 divided by grossing denominator (Scotland) 1) for **Scottish Rate 1**

$$L_n = T_n SR_1 (100 \div gds_1)$$

Note: This Tax Formula may be expressed in the same style as all subsequent Tax Formulae, provided 2 additional parameter values (k_0 and GSc_0) are included in the system, both always taking value zero. Thus

$$L_n = Sk_0 + (T_n - GSc_0) SR_1 (100 \div gds_1)$$

Tax Formula 2	<p>Tax to date = Threshold tax 1, plus tax at Rate 2 on the excess of Nominal Taxable Pay to date over Threshold 1 multiplied by the grossing fraction (100 divided by grossing denominator 2) for Rate 2</p> $L_n = k_1 + ((T_n - Gc_1) R_2(100 \div gd_2))$
Tax Formula 2(S)	<p>Tax to date = Threshold tax 1, plus tax at Scottish Rate 2 on the excess of Nominal Taxable Pay to date over Threshold 1 multiplied by the grossing fraction (100 divided by grossing denominator (Scotland) 2) for Scottish Rate 2</p> $L_n = Sk_1 + ((T_n - GSc_1) SR_2 (100 \div gds_2))$
Tax Formula 3	<p>Tax to date = Threshold tax 2, plus tax at Rate 3 on the excess of Nominal Taxable Pay to date over Threshold 2 multiplied by the grossing fraction (100 divided by grossing denominator 3) for Rate 3</p> $L_n = k_2 + ((T_n - Gc_2) R_3 (100 \div gd_3))$
Tax Formula 3(S)	<p>Tax to date = Threshold tax 2, plus tax at Scottish Rate 3 on the excess of Nominal Taxable Pay to date over Threshold 2. multiplied by the grossing fraction (100 divided by grossing denominator (Scotland) 3) for Scottish Rate 3</p> $L_n = Sk_2 + ((T_n - GSc_2) SR_3 (100 \div gds_3))$
	and so on, up to
Tax Formula x + 1	<p>Tax to date = Threshold tax (x), plus tax at Rate (x + 1) on the excess of Nominal Taxable Pay to date over Threshold (x) multiplied by the grossing fraction (100 divided by grossing denominator (x + 1)) for Rate (x + 1)</p> $L_n = k_{(x)} + ((T_n - Gc_{(x)}) R_{(x+1)} (100 \div gd_{(x+1)}))$
Tax Formula x + 1(S)	<p>Tax to date = Threshold tax (x), plus tax at Scottish Rate (x + 1) on the excess of Nominal Taxable Pay to date over Threshold (x) multiplied by the grossing fraction (100 divided by grossing denominator (Scotland) (x + 1)) for Scottish Rate (x + 1)</p> $L_n = Sk_{(x)} + [(T_n - GSc_{(x)}) SR_{(x+1)} (100 \div gds_{(x+1)})]$

where **x** = number of Bandwidths currently shown in Appendix A

Take the calculations for all Tax Formulae to 4 decimal places of a pound without applying any correction to the final place, and then finally round down the result if necessary to the nearest multiple of 1p below.

3.5 Stage 4 Calculation of True Gross Pay to date

3.5.1 In order to determine the amount of pay in the week to which the overriding Regulatory limit is to be applied it is necessary to calculate the amount of True Gross Pay in relation to the net payment for the appropriate week.

3.5.2 This is done by first taking the Cumulative FOT Pay to date calculated at Stage 1 and then adding back the tax due to date calculated at Stage 3. The resulting figure is the amount of True Gross Pay to date. There is no rounding at this stage.

Payrolled benefits in kind are not included in the overriding limit calculation so they have not been included in Stages 4, 5 and 6.

Mathematically, $TGP_n = P_n + L_n$

3.6 Stage 5 Calculation of True Gross Pay

3.6.1 Having calculated True Gross Pay to date it is therefore possible to calculate the amount of True Gross Pay for the week. This is done by deducting the previous weeks True Gross Pay to date from the current equivalent.

Mathematically $tgp_n = TGP_n - TGP_{(n-1)}$

3.7 Stage 6 Calculation of Tax Deduction or Refund for the Week

3.7.1 Normally, deducting the previous week's tax paid to date from the current equivalent gives the tax liability for the week (*subject to paragraph 3.7.2 below*) or, if appropriate, the tax refundable.

Mathematically, $I_n = L_n - L_{(n-1)}$

Positive values of I_n are deductions.

Negative values of I_n are refunds.

3.7.2 NB. Note, however, that the maximum tax deductible for the week is limited to the amount given by applying the overriding Regulatory limit, **Maxrate**, to the pay for the week excluding any payrolled benefits in kind. Calculate the maximum tax deductible for the week to 4 decimal places of a pound without applying any correction to the final place and round down if necessary to the nearest 1p below.

Mathematically, where the overriding Regulatory limit applies

$$I_n = M \times tgp_n$$

Note also, to ensure the correct action in subsequent CUMULATIVE (but NOT Week 1/Month 1 basis) calculations, the liability previously calculated by the Tax Table routines above has to be adjusted so that only the amount of tax actually deducted is included in the cumulative total of tax due and paid to date. Thus, where the code is operating CUMULATIVELY, the amount not deducted this week is effectively taken into account in subsequent calculations and recovered where possible.

Mathematically, therefore, where the overriding Regulatory limit applies, and the tax code is operating cumulatively, the liability calculated at paragraph 3.4.4. has to be reduced to :-

$$L_n = L_{(n-1)} + (M \times t_{gpn})$$

3.7.3 **NOTE.** Where the Regulatory limit applies, the computer Specification reduces the cumulative liability for this week (originally calculated per the Tax Tables) to reflect the tax actually deducted because of the operation of the limit. This lower cumulative figure is then used in the calculation of the liability for the following week.

The minimum recording requirement for audit etc. purposes is to record the date, true gross pay, code and tax deducted for any payment and to keep such records as to enable the detail of the calculation (eg. FOT pay, free pay or additional pay and overriding limit etc.) to be reproduced.

Forms P45 and P60 are only required to show the tax actually deducted. Any amount not deducted at the end of the year is not required to be reported to HMRC. Any tax outstanding at the end of the year (because of the correct operation of the Regulatory limit) will be a matter between HMRC and the employee.

3.7.4 **Note for Programmers : Negative Pay**

If your system allows for the calculation or input of negative pay (eg. to correct an overpayment of pay in a preceding period) this would, in an ordinary cumulative suffix code case, normally create an apparent refund of tax.

But in a cumulative tax Prefix K or SK code case, either a refund or a deduction of tax can be created - dependent on the comparative values of the negative pay and any Additional Pay calculated by reference to the Prefix K or SK code.

Where a deduction is created, take care NOT to apply the Regulatory limit to the negative pay, as the result would also be negative and therefore arithmetically lower than the deduction previously calculated. (Using a negative Regulatory figure would - INCORRECTLY - change the nature of the liability from a tax deduction to an apparent tax refund).

The application of the Regulatory limit is only intended to apply to positive pay. Where negative pay is concerned, set the Regulatory limit for that payment to zero. Consequently any tax deduction in a negative pay case will therefore also be reduced to zero.

As the Regulatory limit is not relevant to refunds of tax, any apparent refund calculated in a negative pay case, where the code is operating cumulatively, can stand. (Indeed, setting the Regulatory limit to zero when the pay is negative will allow cumulative refunds to proceed - since these are themselves negative values and therefore arithmetically lower than the Regulatory limit of zero!) Where, in a negative pay case the code is operating on a Week 1 basis, each pay period is treated in isolation; no refund can be made and the tax will be Nil.

3.7.5 Where a change of taxpayer status is notified mid-year the method described in this specification will still apply but the calculation will be carried out using the rUK or Scottish rates/bandwidths from that point forward in the year. The new taxpayer status will mean that the software must refer to a different set of rates/bandwidths but cumulative calculations will continue to use the nominal taxable pay to date (specification value T_n) and tax to date (specification value L_n) throughout the year. These values do not have Scottish equivalents, they are general values in the specification that can be used in Scottish or rUK calculations.

3.7.6 The current process for non-cumulative codes will continue and is not impacted by Scottish rates/bandwidths. Where the taxpayer status changes and a non-cumulative code is applied the non-cumulative calculation should be carried out as normal until the employer is notified otherwise by HMRC. Any resulting under/overpayments of tax will be rectified when the employer is notified of the correct cumulative code. Or, if the tax year end has passed, any under/overpayments will be rectified by HMRC as part of the normal year end reconciliation process on the account.

4. COMPUTERISED PAYE TAX ROUTINES - CUMULATIVE CODE BR, SBR - EMPLOYEES PAID WEEKLY OR MONTHLY

4.1 Stage 1 As for cumulative suffix codes, add the pay for the week to the cumulative figure of pay to date for the previous week to give the new figure of pay to date; there is no rounding at this stage.

4.2 Stage 2 Add any Cumulative Payrolled Benefits in Kind to the Cumulative Pay to give the Nominal Taxable Pay to date.

4.3 Stage 3 The Nominal Taxable Pay should be rounded down to the nearest pound, the whole of the rounded pay to date (regardless of how large an amount it is) should be taxed. The routine must then identify whether or not the Scottish rate is applicable.

Is the 'S' identifier present in the code?

If no, the whole of the rounded pay to date (regardless of how large an amount it is) should be taxed at Rate **G** and then multiplied by the grossing factor (100 divided by the grossing denominator for the Basic rate) for Rate **G**, expressed mathematically

$$L_n = T_n G (100 \div GD)$$

If yes, the whole of the rounded pay to date (regardless of how large an amount it is) should be taxed at Rate **G1** and then multiplied by the grossing factor (100 divided by grossing denominator for Basic Rate(Scotland)) for Rate **G1**, expressed mathematically

$$L_n = T_n G1 (100 \div GDS)$$

4.4 The result of the tax calculation in paragraph 4.3 should be rounded down if necessary to the nearest multiple of 1p below.

4.5 Stage 4 Once again, as for cumulative suffix codes, deducting the previous weeks liability to tax to date from the current equivalent gives the tax deductible for the week, or, if appropriate, the tax refundable subject to the overriding regulatory limit. See paragraph 3.7.2.

5. COMPUTERISED PAYE TAX ROUTINES - WEEK 1/MONTH 1 BASIS SUFFIX CODES AND WEEK 1/MONTH 1 BASIS PREFIX K, SK CODES - EMPLOYEES PAID WEEKLY OR MONTHLY

- 5.1 These are suffix codes and prefix K and SK codes not operated on the normal cumulative basis. Each week's payment is treated IN ISOLATION, as if it were the first payment of the Income Tax year to be taxed on a normal suffix or prefix K or SK code. The calculation is in two stages which are explained in detail in the following paragraphs.
- 5.2 Stage 1 Calculate Nominal Taxable Pay for the week. The Nominal Taxable Pay for the week is either the FOT pay plus any Payrolled Benefits in Kind for the week less the Free Pay for Week 1 for suffix codes or the FOT pay plus any Payrolled Benefits in Kind for the week plus the Additional Pay for Week 1 for prefix K and SK codes. Free Pay or Additional Pay for Week 1 is calculated from the numeric part of the code in the normal way (see paragraph 3.3.1).
- 5.3 Stage 2 Calculate the tax due exactly as for payment in Week 1 using a cumulative suffix or prefix K or SK code (see paragraph 3.4).
- 5.4 Stage 3 Calculate the True Gross Pay exactly as for payment in Week 1 using a cumulative suffix or prefix K or SK code (see paragraph 3.6)
- 5.5 The result, of paragraph 5.3 rounded in accordance with paragraph 3.4.4 is the tax deductible for this week, SUBJECT, when necessary, to applying the overriding Regulatory limit to the True Gross Pay for the week (as described in paragraph 3.7.2). Note, however, since each week's payment is treated in isolation, that any tax not deducted because of the operation of the overriding Regulatory limit in a Week 1/Month 1 basis tax code case is NOT taken into account in the calculation for the following week or month; nor does it need to be reported on forms P45 & P60.

Mathematically, where the overriding Regulatory limit applies,

$$I_n = M \times \text{tgp}_n$$

**6. COMPUTERISED PAYE TAX ROUTINES - WEEK 1/MONTH 1 BASIS
CODE BR, SBR - EMPLOYEES PAID WEEKLY OR MONTHLY**

6.1 Each payment is dealt with in isolation and the payment plus any Payrolled Benefits in Kind for the week should be rounded down if necessary to the nearest pound below. The routine must then identify whether or not the Scottish rate is applicable.

Is the 'S' identifier present in the code ?

If no the whole of the rounded payment should be taxed at **Rate (G)**, where G is the parameter of Definition 8. The result is then multiplied by the appropriate grossing factor in accordance with paragraph 4.3.

If yes the whole of the rounded payment should be taxed at **Rate (G1)**, where G1 is the parameter of Definition 8.1. The result is then multiplied by the appropriate grossing factor in accordance with paragraph 4.3.

6.2 The result of the tax calculation in paragraph 6.1 should be rounded down if necessary to the nearest multiple of 1p below and is subject to the overriding regulatory limit. See paragraph 3.7.2.

**7. COMPUTERISED PAYE TAX ROUTINES - PREFIX D, SD CODES -
EMPLOYEES PAID WEEKLY OR MONTHLY**

7.1 The routine must first identify whether or not the Scottish rate is applicable.

Is the 'S' identifier present in the code ?

If no, the whole of the payment plus any Cumulative Payrolled Benefits in Kind (subject only to rounding down, if necessary, to the nearest pound below) is taxed at the appropriate rate and multiplied by the appropriate grossing factor (100 divided by the grossing denominator for the Basic Rate) as follows:

D0	means tax the whole of the rounded payment at	Rate (G + 1) (100 ÷ (GD + 1))
D1	" " " " " " " " " "	Rate (G + 2) (100 ÷ (GD + 2))
D2	" " " " " " " " " "	Rate (G + 3) (100 ÷ (GD + 3))

And so on as necessary to the limit of the current range of Rates shown in Appendix A, where G is the parameter of Definition 8 and GD is the parameter of Definition 9.

If yes, the whole of the payment plus any Cumulative Payrolled Benefits in Kind (subject only to rounding down, if necessary, to the nearest pound below) is taxed at the appropriate rate and then multiplied by the appropriate grossing factor as follows:

SD0	means tax the whole of the rounded payment at	Rate (G1 + 1) (100 ÷ (GDS + 1))
SD1	" " " " " " " " " "	Rate (G1 + 2) (100 ÷ (GDS + 2))
SD2	" " " " " " " " " "	Rate (G1 + 3) (100 ÷ (GDS + 3))

And so on as necessary to the limit of the current range of Rates shown in Appendix B, where G1 is the parameter of Definition 8.1 and GD1 is the parameter of Definition 9.1.

7.2 The result of the tax calculation in paragraph 7.1 should be rounded down if necessary to the nearest multiple of 1p below and is subject to the overriding regulatory limit. See paragraph 3.7.2.

8. COMPUTERISED PAYE TAX ROUTINES - PREFIX D, SD CODES - WEEK 1 OR MONTH 1 BASIS

8.1 The routine must first identify whether or not the Scottish rate is applicable.

Is the 'S' identifier present in the code?

If no, each payment is dealt with in isolation, and the whole of the payment plus any Cumulative Payrolled Benefits in Kind (subject only to rounding down, if necessary, to the nearest pound below) is taxed at the appropriate rate and multiplied by the appropriate grossing factor (100 divided by the grossing denominator for the Basic Rate) as follows:

D0 means tax the whole of the rounded payment at **Rate (G + 1) (100 ÷ (GD + 1))**

D1 " " " " " " " " **Rate (G + 2) (100 ÷ (GD + 2))**

D2 " " " " " " " " **Rate (G + 3) (100 ÷ (GD + 3))**

And so on as necessary to the limit of the current range of Rates shown in Appendix A, where G is the parameter of Definition 8 and GD is the parameter of Definition 9.

If yes, each payment is dealt with in isolation, and the whole of the payment plus any Cumulative Payrolled Benefits in Kind (subject only to rounding down, if necessary, to the nearest pound below) is taxed at the appropriate rate and then multiplied by the appropriate grossing factor as follows:

SD0 means tax the whole of the rounded payment at **Rate (G1 + 1) (100 ÷ (GDS + 1))**

SD1 " " " " " " " " **Rate (G1 + 2) (100 ÷ (GDS + 2))**

SD2 " " " " " " " " **Rate (G1 + 3) (100 ÷ (GDS + 3))**

And so on as necessary to the limit of the current range of Rates shown in Appendix B, where G1 is the parameter of Definition 8.1 and GD1 is the parameter of Definition 9.1.

8.2 The result of the tax calculation in paragraph 8.1 should be rounded down if necessary to the nearest multiple of 1p below and is subject to the overriding regulatory limit. See paragraph 3.7.2.

9. COMPUTERISED PAYE TAX ROUTINES - CODE SPECIFIED FOR EMERGENCY USE - ALL EMPLOYEES

9.1 This is a suffix code which is prescribed for emergency use and in certain circumstances is operated on the Week 1/Month 1 basis (see paragraph 5 or 12.3 as appropriate). The value of the code may be changed from time to time, and will be notified on form P7X or form P9X. There is only one emergency code for the entire UK, therefore the 'S' identifier should NOT be applied to this code. The circumstances in which the code should be used are outlined in the "*Employer Help Books*".

10. COMPUTERISED PAYE TAX ROUTINES - EMPLOYEES PAID AT OTHER THAN REGULAR WEEKLY OR MONTHLY INTERVALS

- 10.1 Cumulative suffix codes and cumulative prefix K, SK codes. The "*Employer Further Guide to PAYE and NICs*" (CWG2) explains which week's or month's Tables should be used for each payment. The tax calculation will then be in accordance with paragraph 3 of this Specification, and will be subject, when necessary to applying the overriding Regulatory limit.
- 10.2 Cumulative code BR, SBR. The tax will follow paragraph 4 of this Specification whatever the interval between payments.
- 10.3 Week 1/Month 1 basis suffix codes and prefix K, SK codes.
The appropriate Tables will be those for the number of weeks (or months) which have elapsed since the last FOT payment. For example, where the previous FOT payment was made in Week 10, and the current FOT payment is being made in Week 13, then the appropriate Table will be that for Week 3. The tax calculation will then follow paragraph 3.3 and 3.4 of this Specification, SUBJECT, when necessary, to applying the overriding Regulatory limit to the True Gross Pay for the period (as described in paragraph 3.7.2 and in the note in paragraph 5.5).
- 10.4 Week 1/Month 1 basis code BR, SBR. The tax calculation will follow paragraph 6 of this Specification, whatever the interval between payments.
- 10.5 Prefix D, SD codes. The tax calculation will follow paragraphs 7 and 8 of this Specification, whatever the interval between payments.

11. COMPUTERISED PAYE TAX ROUTINES – FOT PAYMENTS IN WEEKS 53, 54 or 56

- 11.1 Full instructions are given in the "*Employer Further Guide to PAYE and NICs*" (CWG2) which explains the use of the Tables for Weeks 1, 2 or 4 as appropriate on a non-cumulative basis. The Nominal Taxable Pay should be rounded down if necessary to the nearest pound. The calculation will then follow paragraphs 3.3 and 3.4 of this Specification, SUBJECT, when necessary, to applying the overriding Regulatory limit to the pay for the period (as described in paragraph 3.7.2).

12. USE OF THE CODE SUFFIX

- 12.1 The suffix plays no part in the actual tax calculations, but is used to identify those employees whose code is to be increased or reduced under a general authority from the HMRC Office. This authority will be on form P7X (for current year changes) or on form P9X (for changes from 6 April), and will relate to suffixes L, M, and N. It will indicate the date from which the changes are to take effect, and the amounts of the changes. It is important to realise that the change to the numeric part of the codes bearing a particular suffix will not necessarily be in the same amount as the change to the numeric part of the codes bearing other suffixes, nor necessarily will all suffixes be changed at the same time.
- 12.2 The method used for effecting this change to the numeric part of the suffix code should include some safeguard to prevent an inadvertent second change for the same Income Tax year.
- 12.3 Both forms P7X and P9X will include instructions covering the numeric parts of the codes of new employees starting between specified dates.
- 12.4 Any refunds arising from the uplifting of codes of existing employees under P7X authority may be made without further authority from the HMRC Office. No refunds will be due for those employees whose suffix code is operated on a Week 1 or Month 1 basis. (No refunds will be due under P9X authority as the effective date for the amended codes will be the following 6 April).
- 12.5 Prefix codes will not be changed by means of a general authority, nor will suffix codes bearing suffix T. They will be amended, if necessary, by the HMRC Office issuing form P6 at times when changes under a general authority are notified on form P7X; or by form P9 at times when changes under a general authority are notified on form P9X.

13. PROGRAM TESTING

- 13.1 Whenever changes to tax and/or bandwidths occur HMRC will produce a set of test data so developers can check the changes have been implemented correctly.

APPENDIX A

Symbol	Description		Derivation	Parameter values						
				Income Tax Years	2012/2013	2013/2014	2014/2015	2015/2016	2016/2017	2017/2018
				Date from which effective	6/4/2012	6/4/2013	6/4/2014	6/4/2015	6/4/2016	6/4/2017
B ₁	Annual Width of Tax Bands (Bandwidths) for these rates	1 st Rate		£	£	£	£	£	£	
B ₂		2 nd Rate		0	0	0	0	0	0	
B ₃		3 rd Rate		34,370	32,010	31,865	31,785	32,000	33,500	
				115,630	117,990	118,135	118,215	118,000	116,500	

APPENDIX A

Symbol	Description		Derivation	Parameter values						
				Income Tax Years	2012/2013	2013/2014	2014/2015	2015/2016	2016/2017	2017/2018
				Date from which effective	6/4/2012	6/4/2013	6/4/2014	6/4/2015	6/4/2016	6/4/2017
BN ₁	Annual Nominal Width of Tax Bands (Bandwidths) for these rates	1 st Rate		£	£	£	£	£	£	
BN ₂		2 nd Rate		0	0	0	0	0	0	
BN ₃		3 rd Rate		27,496	25,608	25,492	25,428	25,600	26,800	
				69,378	70,794	70,881	70,929	70,800	69,900	

APPENDIX A

Symbol	Description		Derivation	Parameter values						
				Income Tax Years	2012/2013	2013/2014	2014/2015	2015/2016	2016/2017	2017/2018
				Date from which effective	6/4/2012	6/4/2013	6/4/2014	6/4/2015	6/4/2016	6/4/2017
GC ₁	NOMINAL BANDWIDTH 1 CUMULATIVE	1 st Rate	= BN ₁	£ 0	£ 0	£ 0	£ 0	£ 0	£ 0	
GC ₂	NOMINAL BANDWIDTH 2 CUMULATIVE	2 nd Rate	= BN ₁ + BN ₂	27,496	25,608	25,492	25,428	25,600	26,800	
GC ₃	NOMINAL BANDWIDTH 3 CUMULATIVE	3 rd Rate	= BN ₁ + BN ₂ + BN ₃	96,874	96,402	96,373	96,357	96,400	96,700	

APPENDIX A

Symbol	Description	Derivation	Parameter values						
			Income Tax Years	2012/2013	2013/2014	2014/2015	2015/2016	2016/2017	2017/2018
			Date from which effective	6/4/2012	6/4/2013	6/4/2014	6/4/2015	6/4/2016	6/4/2017
K ₁	ANNUAL TAX 1 CUMULATIVE	= B ₁ R ₁	£ 0	£ 0	£ 0	£ 0	£ 0	£ 0	
K ₂	ANNUAL TAX 2 CUMULATIVE	= B ₁ R ₁ + B ₂ R ₂	6,874	6,402	6,373	6,357	6,400	6,700	
K ₃	ANNUAL TAX 3 CUMULATIVE	= B ₁ R ₁ + B ₂ R ₂ + B ₃ R ₃	53,126	53,598	53,627	53,643	53,600	53,300	

APPENDIX A

Symbol	Description	Derivation	Parameter values						
			Income Tax Years	2012/2013	2013/2014	2014/2015	2015/2016	2016/2017	2017/2018
			Date from which effective	6/4/2012	6/4/2013	6/4/2014	6/4/2015	6/4/2016	6/4/2017
R ₁ R ₂ R ₃ R ₄	Rate 1 (1 st Rate) Rate 2 (2 nd Rate) Rate 3 (3 rd Rate) Rate 4 (4 th Rate)		% 10.00 20.00 40.00 50.00	% 10.00 20.00 40.00 45.00	% 10.00 20.00 40.00 45.00	% 10.00 20.00 40.00 45.00	% 10.00 20.00 40.00 45.00	% 10.00 20.00 40.00 45.00	
gd ₁ gd ₂ gd ₃ gd ₄	grossing denominator 1 grossing denominator 2 grossing denominator 3 grossing denominator 4		90.00 80.00 60.00 50.00	90.00 80.00 60.00 55.00	90.00 80.00 60.00 55.00	90.00 80.00 60.00 55.00	90.00 80.00 60.00 55.00	90.00 80.00 60.00 55.00	
G GD	Gpointer GDpointer		2 2	2 2	2 2	2 2	2 2	2 2	
M	Maxrate		50.00%	50.00%	50.00%	50.00%	50.00%	50.00%	

APPENDIX B

Symbol	Description		Derivation	Parameter values							
				Income Tax Years	2017/2018						
				Date from which effective	6/4/2017						
SB ₁	Annual Width of Tax Bands (Scotland) (Bandwidths) for these rates	1 st Rate		£							
SB ₂		2 nd Rate		0							
SB ₃		3 rd Rate		31,500							
				118,500							

APPENDIX B

Symbol	Description		Derivation	Parameter values						
				Income Tax Years	2016/2017	2017/2018				
				Date from which effective	6/4/2016	6/4/2017				
BNS ₁	Annual Nominal Width of Tax Bands (Scotland) (Bandwidths) for these rates	1 st Rate		£	£	£	£	£	£	
BNS ₂		2 nd Rate		0	0					
BNS ₃		3 rd Rate		25,600	25,200					
				70,800	71,100					

APPENDIX B

Symbol	Description	Derivation	Parameter values						
			Income Tax Years	2016/2017	2017/2018				
			Date from which effective	6/4/2016	6/4/2017				
GSC ₁	NOMINAL BANDWIDTH 1 (SCOTLAND) CUMULATIVE	= BNS ₁	£ 0	£ 0	£	£	£	£	
GSC ₂	NOMINAL BANDWIDTH 2 (SCOTLAND) CUMULATIVE	= BNS ₁ + BNS ₂	25,600	25,200					
GSC ₃	NOMINAL BANDWIDTH 3 (SCOTLAND) CUMULATIVE	= BNS ₁ + BNS ₂ + BNS ₃	96,400	96,300					

APPENDIX B

Symbol	Description	Derivation	Parameter values						
			Income Tax Years	2016/2017					
			Date from which effective	6/4/2016					
SK ₁	ANNUAL TAX 1 (SCOTLAND) CUMULATIVE	=B ₁ SR ₁	£	0					
SK ₂	ANNUAL TAX 2 (SCOTLAND) CUMULATIVE	=B ₁ SR ₁ + B ₂ SR ₂		6,400					
SK ₃	ANNUAL TAX 3 (SCOTLAND) CUMULATIVE	=B ₁ SR ₁ + B ₂ SR ₂ + B ₃ SR ₃		53,600					

Note: For parameter values for 2017/2018 onwards – see table on next page.

APPENDIX B

Symbol	Description	Derivation	Parameter values						
			Income Tax Years	2017/2018					
			Date from which effective	6/4/2017					
SK ₁	ANNUAL TAX 1 (SCOTLAND) CUMULATIVE	$=SB_1SR_1$	£	0					
SK ₂	ANNUAL TAX 2 (SCOTLAND) CUMULATIVE	$=SB_1SR_1 + SB_2SR_2$		6,300					
SK ₃	ANNUAL TAX 3 (SCOTLAND) CUMULATIVE	$=SB_1SR_1 + SB_2SR_2 + SB_3SR_3$		53,700					

APPENDIX B

Symbol	Description	Derivation	Parameter values						
			Income Tax Years	2016/2017	2017/2018				
			Date from which effective	6/4/2016	6/4/2017				
SR ₁ SR ₂ SR ₃ SR ₄	Rate 1 (Scotland) (1 st Rate) Rate 2 (Scotland) (2 nd Rate) Rate 3(Scotland) (3 rd Rate) Rate 4(Scotland) (4 th Rate)		% 10.00 20.00 40.00 45.00	% 10.00 20.00 40.00 45.00		% %	% %	% %	% %
gds ₁ gds ₂ gds ₃ gds ₄	grossing denominator 1 grossing denominator 2 grossing denominator 3 grossing denominator 4		90.00 80.00 60.00 55.00	90.00 80.00 60.00 55.00					
G1 GDS	Gpointer GDpointer		2 2	2 2					
M	Maxrate		50.00%	50.00%					

APPENDIX C

GLOSSARY OF SYMBOLS

a1	Free Pay for Week 1
B1	Bandwidth 1 – Annual bandwidth of 1 st rate of tax.
B2	Bandwidth 2 – Annual bandwidth of 2 nd rate of tax
B3	Bandwidth 3 – Annual bandwidth of 3 rd rate of tax
B4	Bandwidth 4 – Annual bandwidth of 4 th rate of tax
BN1	Nominal Bandwidth 1 – Annual nominal bandwidth of 1 st rate of tax
BN2	Nominal Bandwidth 2 – Annual nominal bandwidth of 2 nd rate of tax
BN3	Nominal Bandwidth 3 – Annual nominal bandwidth of 3 rd rate of tax
BN4	Nominal Bandwidth 3 – Annual nominal bandwidth of 4 th rate of tax
BNS1	Nominal Bandwidth 1 (Scotland) – Annual nominal bandwidth of 1 st rate of tax
BNS2	Nominal Bandwidth 2 (Scotland) – Annual nominal bandwidth of 2 nd rate of tax
BNS3	Nominal Bandwidth 3 (Scotland) – Annual nominal bandwidth of 3 rd rate of tax
BNS4	Nominal Bandwidth 3 (Scotland) – Annual nominal bandwidth of 4 th rate of tax
e1	Additional Pay for Week 1
G	G pointer - Pointer to Basic rate
G1	G pointer - Pointer to Basic rate (Scotland)
GC1	<i>Cumulative Nominal Bandwidth 1</i> – Nominal Bandwidth 1
GC2	<i>Cumulative Nominal Bandwidth 2</i> – Nominal Bandwidth 1 & 2
GC3	<i>Cumulative Nominal Bandwidth 3</i> – Nominal Bandwidth 1, 2 & 3
GC4	<i>Cumulative Nominal Bandwidth 4</i> – Nominal Bandwidth 1, 2, 3 & 4
Gc1	Threshold 1 - <i>Cumulative Nominal Bandwidth 1 x $\frac{n}{52}$</i>
Gc2	Threshold 2 - <i>Cumulative Nominal Bandwidth 2 x $\frac{n}{52}$</i>
Gc3	Threshold 3 - <i>Cumulative Nominal Bandwidth 3 x $\frac{n}{52}$</i>
Gc4	Threshold 4 - <i>Cumulative Nominal Bandwidth 4 x $\frac{n}{52}$</i>
gd1	Grossing denominator 1
gd2	Grossing denominator 2
gd3	Grossing denominator 3
gd4	Grossing denominator 4
gds1	Grossing denominator 1 (Scotland)
gds2	Grossing denominator 2 (Scotland)
gds3	Grossing denominator 3 (Scotland)
gds4	Grossing denominator 4 (Scotland)
GD	Pointer to Basic Rate grossing denominator
GDS	Pointer to Basic Rate (Scotland) grossing denominator

GSC1	<i>Cumulative Nominal Bandwidth (Scotland) 1</i> – Nominal Bandwidth 1
GSC2	<i>Cumulative Nominal Bandwidth (Scotland) 2</i> – Nominal Bandwidth 1 & 2
GSC3	<i>Cumulative Nominal Bandwidth (Scotland) 3</i> – Nominal Bandwidth 1, 2 & 3
GSC4	<i>Cumulative Nominal Bandwidth (Scotland) 4</i> – Nominal Bandwidth 1, 2, 3 & 4
GSc1	Threshold 1 (Scotland) - <i>Cumulative Nominal Bandwidth 1</i> x $\frac{n}{52}$
GSc2	Threshold 2 (Scotland) - <i>Cumulative Nominal Bandwidth 1</i> x $\frac{n}{52}$
GSc3	Threshold 3 (Scotland) - <i>Cumulative Nominal Bandwidth 1</i> x $\frac{n}{52}$
GSc4	Threshold 4 (Scotland) - <i>Cumulative Nominal Bandwidth 1</i> x $\frac{n}{52}$
GSv1	GSCvalue 1 i.e GSc1 rounded if necessary to the nearest £1 above
GSv2	GSCvalue 2 i.e GSc2 rounded if necessary to the nearest £1 above
GSv3	GSCvalue 3 i.e GSc3 rounded if necessary to the nearest £1 above
GSv4	GSCvalue 4 i.e GSc4 rounded if necessary to the nearest £1 above
Gv1	GCvalue 1 i.e Gc1 rounded if necessary to the nearest £1 above
Gv2	GCvalue 2 i.e Gc2 rounded if necessary to the nearest £1 above
Gv3	GCvalue 3 i.e Gc3 rounded if necessary to the nearest £1 above
Gv4	GCvalue 4 i.e Gc4 rounded if necessary to the nearest £1 above
K1	<i>Cumulative Annual Tax 1</i> - Annual tax 1
K2	<i>Cumulative Annual Tax 2</i> - The sum of Annual taxes 1 & 2
K3	<i>Cumulative Annual Tax 3</i> - The sum of Annual taxes 1, 2 & 3
K4	<i>Cumulative Annual Tax 3</i> - The sum of Annual taxes 1, 2, 3 & 4
k1	Threshold 1 - <i>Cumulative Annual Tax 1</i> x $\frac{n}{52}$
k2	Threshold 2 - <i>Cumulative Annual Tax 2</i> x $\frac{n}{52}$
k3	Threshold 3 - <i>Cumulative Annual Tax 3</i> x $\frac{n}{52}$
k4	Threshold 4 - <i>Cumulative Annual Tax 3</i> x $\frac{n}{52}$
Ln	Tax liability up to and including Week n
ln	Tax deductible or refundable in Week n (NB. lower case l)
M	Maxrate - Maximum percentage tax deductible. (Also referred to as the overriding Regulatory limit).
n	Week number
pbik	Payrolled Benefits in Kind for Week n
Pbik	Cumulative Payrolled Benefits in Kind up to and including Week n (NB upper case P)
Pn	Cumulative Free of Tax Pay up to and including Week n (NB upper case P)
pn	Free of Tax Pay up to and including Week n (NB lower case p)

R1	Rate 1 – 1 st rate of tax
R2	Rate 2 – 2 nd rate of tax
R3	Rate 3 – 3 rd rate of tax
R4	Rate 4 – 4 th rate of tax
SB1	Bandwidth 1 (Scotland) – Annual bandwidth of 1 st rate of tax.
SB2	Bandwidth 2 (Scotland) – Annual bandwidth of 2 nd rate of tax
SB3	Bandwidth 3 (Scotland) – Annual bandwidth of 3 rd rate of tax
SB4	Bandwidth 4 (Scotland) – Annual bandwidth of 4 th rate of tax
SK1	<i>Cumulative Annual Tax 1</i> - Annual tax 1 (Scotland)
SK2	<i>Cumulative Annual Tax 2</i> - The sum of Annual taxes 1 & 2 (Scotland)
SK3	<i>Cumulative Annual Tax 3</i> - The sum of Annual taxes 1, 2 & 3 (Scotland)
SK4	<i>Cumulative Annual Tax 4</i> - The sum of Annual taxes 1, 2, 3 & 4 (Scotland)
Sk1	Threshold tax 1 (Scotland) - <i>Cumulative Annual tax 1 x $\frac{n}{52}$</i>
Sk2	Threshold tax 2 (Scotland) - <i>Cumulative Annual tax 2 x $\frac{n}{52}$</i>
Sk3	Threshold tax 3 (Scotland) - <i>Cumulative Annual tax 3 x $\frac{n}{52}$</i>
Sk4	Threshold tax 3 (Scotland) - <i>Cumulative Annual tax 4 x $\frac{n}{52}$</i>
SR1	Rate 1 (Scotland) – 1 st rate of tax
SR2	Rate 2 (Scotland) – 2 nd rate of tax
SR3	Rate 3 (Scotland) – 3 rd rate of tax
SR4	Rate 4 (Scotland) – 4 th rate of tax
TGP_n	True Gross Pay up to and including Week n
tgpn	True Gross Pay for Week n
T_n	Taxable Pay up to and including Week n after applying rounding rules
U_n	Taxable Pay up to and including Week n before applying rounding rules

APPENDIX D

SUMMARY OF FORMULAE

Calculation of Cumulative Pay to date (paragraph 3.2.1)

$$P_n = P_{(n-1)} + p_n$$

Calculation of Taxable Pay to date (paragraph 3.3.2)

$$\text{FOR SUFFIX CODES} \quad U_n = P_n + P_{bik} - na1$$

$$\text{FOR PREFIX K, SK CODES} \quad U_n = P_n + P_{bik} + ne1$$

Calculation of the tax due to date (paragraphs 3.4.3 & 3.4.4)

For Codes with no 'S' identifier

Income Test 1	Is $U_n \leq Gv_1$?	If yes, use Tax Formula 1 If no, consider Income Test 2
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Income Test 2	Is $U_n \leq Gv_2$?	If yes, use Tax Formula 2 If no, consider Income Test 3
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and so on up to

Income Test (x)	Is $U_n \leq Gv_{(x)}$?	If yes, use Tax Formula (x) If no, use Tax Formula (x + 1)
-----------------	--------------------------	---

Tax Formula 1 $L_n = k_0 + ((T_n - Gc_0) R_1(100 \div gd_1))$

Tax Formula 2 $L_n = k_1 + ((T_n - Gc_1) R_2(100 \div gd_2))$

Tax Formula 3 $L_n = k_2 + ((T_n - Gc_2) R_3(100 \div gd_3))$

and so on up to

Tax Formula (x) $L_n = k_{(x)} + ((T_n - Gc_{(x)}) R_{(x+1)} (100 \div gd_{(x+1)}))$

Mathematically, FOR SUFFIX CODES

since $U_n = P_n + P_{bik} - na1$

if $na1 \geq (P_n + P_{bik})$ then $U_n \leq 0$

In such a case $L_n = 0$

and it follows that in cases going through Stage 3, $U_n > 0$

FOR PREFIX K, SK CODES, all cases will proceed to Stage 3 since U_n will always be positive.

For Codes with 'S' identifier

Income Test 1(S) Is $U_n \leq GSV_1$? If yes, use Tax Formula 1(S)
If no, consider Income Test 2(S)

Income Test 2(S) Is $U_n \leq GSV_2$? If yes, use Tax Formula 2(S)
If no, consider Income Test 3(S)

and so on up to

Income Test (x)(S) Is $U_n \leq GSV_{(x)}$? If yes, use Tax Formula (x)(S)
If no, use Tax Formula (x + 1)(S)

Tax Formula 1(S) $L_n = Sk_0 + ((T_n - GSc_0) SR_1(100 \div gds_1))$

Tax Formula 2(S) $L_n = Sk_1 + ((T_n - GSc_1) SR_2(100 \div gds_2))$

Tax Formula 3(S) $L_n = Sk_2 + ((T_n - GSc_2) SR_3(100 \div gds_3))$

and so on up to

Tax Formula (x)(S) $L_n = Sk_{(x)} + ((T_n - GSc_{(x)}) SR_{(x+1)} (100 \div gds_{(x+1)}))$

Calculation of True Gross Pay to date

$$TGP_n = P_n + L_n$$

Calculation of True Gross Pay for the week (paragraph 3.6)

$$tgp_n = TGP_n - TGP_{(n-1)}$$

Calculation of Tax Deduction or Refund for the week (paragraph 3.7)

$$I_n = L_n - L_{(n-1)}$$

Positive values are deductions

Negative values are refunds

Where the overriding Regulatory limit applies

$$I_n = M \times tgp_n$$

Where the tax code is operating cumulatively

$$L_n = L_{(n-1)} + (M \times tgp_n)$$

(The Tax Tables set out in this Specification are provided for use by Payroll Software Developers and employers whose payroll calculations are carried out by computer.)

This Specification will continue in use until you are told to amend or destroy it. Details of amendments (or, where appropriate, a new Specification) will be provided under the arrangements described in paragraph 1.5 of the Specification. Amendments should be recorded in the space provided overleaf.

These Tax Tables have been prepared by the Board of HMRC under Section 684 Income Tax (Earnings and Pensions) Act 2003.

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