deleq – a \LaTeX\ Macro for Partial Numbering of Equations*

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Abstract

To enable a more flexible equation numbering, especially “partial” equation numbers (‘3a’, ‘3b’ etc.), the deleq package has been developed. It can produce partial equation numbers intermixed with ordinary equation numbers also in an eqnarray-like environment, the intermixing can occur within one environment. References to a partially numbered equation can be both the complete equation number (‘3b’) or only the main equation number (‘3’). Furthermore, equation numbers can be recycled without disturbing the ordinary equation numbers. The package also provides commands for putting commentary text in an eqnarray environment. Both standard \LaTeX\ class options leqno and fleqn\footnote{Not all commands of deleq work with the fleqn option.} work with deleq.

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1 Introduction

deleq is a \LaTeX\ package which makes partial numbering of equations possible. It is meant to be used when numbering such as 3a, 3b, etc. is desired. The default is to give an equation number like ‘3a’ without period and with the ‘a’ typeset in roman font. It can be used in article as well as book and report document classes. The examples given below are valid for the article class. deleq is fully compatible with the leqno documentclass option and almost fully with the fleqn class option. Equations can be numbered either 3, 3a, 3b, …, or 2, 3a, 3b, ….. Also, equation numbers within eqnarray-like environments can be numbered 3, 3a, 3b, … or starting at 3a, which can follow both after equation 2b or 3. An eqnarray-like environment can have its first equation numbered 3b if the nearest previous equation is 3a. Within one eqnarray-like environment, equations can be numbered 3a, 3b, 4, 4a, 4b, 5a, 5b, etc., and also not numbered lines are possible (\texttt{\nonumber} works with some limitations). Furthermore, equation numbers can be “recycled”. If equation 3 is repeated after equation 8, it can still have the numbering set to 3, and be followed by (a new) equation 9. “Recycled” equation numbers can receive partial numbers (3a, 3b, …); partially numbered equations can also be “recycled” (but at this stage, the latter can not receive new partial numbers neatly, it will come out like ‘3ba’ if equation 3b is the “recycled” equation). Two commands are supplied which enable the user to write commentary texts in eqnarray-like environments without interfering with the alignment.

This userguide is also available in .pdf-format on the internet. It is found from my \LaTeX\ web page: http://www.homenet.se/matsd/latex/

\footnote{This document describes deleq version 4.41a, last revised 1997/06/05}
\footnote{Email: matsd@sssk.se Web: http://www.homenet.se/matsd/}
1.1 History

deleq.sty was originally written for \LaTeX 2.09, and contained several commands which became obsolete with the introduction of \LaTeXe. These commands have been removed. The first release for \LaTeXe was v.4.0, of Oct. 14, 1994. The December 1994 release (v.4.1, Dec. 27, 1994) was the first which was compatible with the docstrip utility of Johannes Braams, Denys Duchier and Frank Mittelbach. In release v.4.2 new abilities to reference entire deqarr and ddeqar environments and enhanced abilities for recycled equation numbers were introduced. Also in deleq v.4.2 this documentation was revised and some internal commands compacted. A previous release, v.4.3, was made nessecary because the changed handeling of arguments in connection with the options in \LaTeXe of 1995/06/01. In release v.4.4, compatibility with the \LaTeXe class option fleqn was introduced. In v.4.41 only some changes to the documentation have been introduced.

deleq version 4.41 has been tested with \LaTeXe of 1997/06/01 running \TeX 3.14159 in MiKTeX 1.07 under Windows 95. Please send bug reports (see below), corrections, additions, suggestions, etc. to me at matsd@sssk.se. Version 3.02 is the last (non-supported) version for \LaTeXe 2.09.

(Command names are a mixture of \LaTeX, Swedish and a bit of the author’s fantasy...)

1.2 Known Problems

\eqreqno, \deqreqno, and \ddeqreqno on the last line in a \deqarr, \ddeqarr, eqnarray, or eqnarray*, there will be an extra blank line with an equation number (not in the * form) at the end of the environment. To avoid this problem, use
\eqreqno[-\jotbaseline]{FOO} \nonumber instead of \eqreqno{FOO} (the analogues for \deqreqno and \ddeqreqno are obvious).

2 Userguide

2.1 Requirements

The file deleq.sty must be available in the user’s \TEXINPUTS directories. It requires \LaTeXe of 1996/12/01 (or newer).

2.2 Usage

The package is included by stating
\usepackage{deleq}

In the document preamble. The documentclass option leqno is fully supported, and the option fleqn is recognized by the environments defined in deleq. Other class or package options do not have any effect on deleq.

2.3 Environments

The package defines the following five environments:

\deqn \deqn is an equation environment for automatic numbering of the first equation of type ‘3a’;
\ddeqn \ddeqn is an equation used for automatic numbering of the equations following the one in \deqn, see also details below;
\deqarr \deqarr is an environment for automatic partial equation numbering in eqnarray-like environment

\footnote{fleqn incompatibility was pointed out by Peter Kruijt (peterk@wfw.wtb.tue.nl)}
with \texttt{deqn} functionality for the first equation;

\textbf{ddeqar} \quad \texttt{ddeqar} similar to \texttt{deqarr} environment, but with \texttt{ddeqn} behaviour for the first equation, see details below;

\textbf{deqarr} \quad \texttt{deqarr} this is an ‘eqnarray’-like environment specially designed for recycled equation numbers.

\section*{2.4 Commands}

The package defines the following fourteen user commands:

\begin{verbatim}
\nydeqno
\heqno
\reqno{FOO}
\rnreqno{FOO}
\rdeqno{FOO}
\eqreqno[\texttt{len}]{FOO}
\ddreqno[\texttt{len}]{FOO}
\arrlabel{FOO}
\where
\rem{\texttt{text}}
\nydeleqno
\deleqno
\jotbaseline
\end{verbatim}

\section*{2.5 Notice}

\begin{verbatim}
\nydeqno
\heqno
\arrlabel
\deqarr
\ddeqarr
\end{verbatim}

1. The use of \texttt{arrlabel} may give unexpected results if any of the commands \texttt{nydeqno} or \texttt{heqno} is used in the same \texttt{deqarr} or \texttt{ddeqar} environment.

2. If you use \texttt{nydeqno}, \texttt{heqno}, \texttt{reqno}, \texttt{rnreqno}, \texttt{rdeqno}, \texttt{eqreqno}, \texttt{ddreqno}, \texttt{nydeleqno}, or \texttt{deleqno} in combination with \texttt{label{FOO}}, \texttt{\label{FOO}} should appear after the \texttt{deleq}-command;

3. If you change the appearance of equation numbers (\textit{e.g.} use ‘[2]’ instead of ‘(2)’), \texttt{deleq}’s commands may not typeset equations with partial numbers like your ordinary equations.

4. The class option \texttt{fleqn} is not recognized by the commands \texttt{reqno}, \texttt{rnreqno}, \texttt{rdeqno}, \texttt{nydeleqno}, and \texttt{deleqno}.

\section*{3 Syntax}

Here follows a more detailed description of the different environments and commands.

\textbf{deqn} \quad \begin{verbatim}
\begin{deqn} ... \end{deqn}
\end{verbatim}

Typesets an equation just like \begin{verbatim}\begin{equation} ... \end{equation}\end{verbatim} does, but gives it a number such as ‘3a’ instead of ‘3’ (always ‘a’). It steps the main equation counter.

\textbf{ddeqn} \quad \begin{verbatim}
\begin{ddeqn} ... \end{ddeqn}
\end{verbatim}

Typesets an equation just like \begin{verbatim}\begin{equation} ... \end{equation}\end{verbatim} does, but gives it a number such as ‘3b’, ‘3c’, … instead of ‘3’, ‘4’, … when following after another partially
numbered equation. When following after an ordinarily numbered equation (‘3’) it gives a partial equation number with the last used ordinary equation number, e.g. ‘3a’. Can be made to produce the result of \texttt{deqn} environment by the use of \texttt{nydeqno} (see below). \texttt{ddeqn} does not step the main equation counter.

\texttt{deqarr} \begin{deqarr} ... \end{deqarr}
Typesets an equation array just like \begin{eqnarray} ... \end{eqnarray} does, but gives the first numbered equation a number like ‘3a’ instead of ‘3’ (always ‘a’), and the following ‘3b’, ‘3c’ etc. It steps the main equation counter. The \texttt{nonumber} command works just like in the \texttt{eqnarray} environment on the partial equation counter. Thus, if you use \texttt{nonumber} on all lines in an \texttt{deqarr} environment (or on all lines before or between \texttt{heqno} or \texttt{nydeleqno}) the equation numbering in your document will be incorrect. There is no warning issued by \LaTeX{} if this happens. If you want blank lines and then a \texttt{heqno}’ed equation followed by partially numbered equations, use the \texttt{ddeqar} environment instead. The same is true for \texttt{nydeqno}’ed equations.

\texttt{ddeqar} \begin{ddeqar} ... \end{ddeqar}
Typesets an equation array just like \begin{eqnarray} ... \end{eqnarray} does, but gives the equation numbers such as ‘3a’ if following after an equation numbered ‘3’ (ordinary equation number) and numbers such as ‘3c’ if following after a partially numbered equation ‘3b’. Can be made to produce the result of \texttt{deqarr} environment by the use of \texttt{nydeqno}. \texttt{ddeqar} does not step the main equation counter. The \texttt{nonumber} command works like in the \texttt{deqarr} environment.

\texttt{deqrarr} \begin{deqrarr} ... \end{deqrarr}
This environment is meant to host recycled equations and has \texttt{eqnarray} structure. By default, it issues no equation number at all on a line which ends with \texttt{\}. The use of \texttt{\label{FOO}} within \texttt{deqrarr} returns the present partial equation number of recycled equations (just like with \texttt{\rndeqno} and \texttt{\rdeqno}). Note that neither \texttt{heqno} nor \texttt{nydeleqno} gives any equation numbers at all in the \texttt{deqrarr} environment.

\texttt{nydeqno} \texttt{nydeqno}
Used within \texttt{deqarr} and \texttt{ddeqar} environments to step the main equation number by one and reset the partial equation number to ‘a’; thus, \texttt{nydeqno} gives equation number ‘4a’ when following after equation ‘3c’.

\texttt{heqno} \texttt{heqno}
Used within \texttt{deqarr} and \texttt{ddeqar} environments to step the main equation number by one and to produce an ordinary equation number; thus, gives equation number ‘4’ when following equation ‘3c’. Equations following the \texttt{heqno}-ed will be partially numbered with the \texttt{heqno}-ed equation’s number as the main number, e.g. ‘4a’ (unless it has a \texttt{nydeqno} command, which in this case would produce the equation number ‘5a’).

\texttt{reqno} \texttt{reqno{FOO}}
Is used when repeating an equation with its original number, “recycling” the equation number. \texttt{reqno} takes the argument \texttt{FOO}, which has to be defined by a \texttt{\label{FOO}} in the original equation. It can only be used within $$ ... $$. It does not affect the equation number counter, nor the ordinary partial equation number counter. However, it resets the partial equation number counter for the \texttt{\rndeqno}, \texttt{\rdeqno}, \texttt{\deqreqno}, and \texttt{\ddeqreqno} commands. If used with a \texttt{\label{FOO}} command, the .aux-file will only contain the page
number of label FOOO. This command is not compatible with the class option fleqn. Instead of $$ ... \reqno{FOO} $$, use a one-line deqrarr environment with the commands \eqreqno[-\jotbaseline]{FOO} \nonumber at the end.

\rnreqno \rnreqno{FOO}

Adds a partial equation number to an old equation number, specified by the FOO label. If FOO refers to equation ‘4’, \rnreqno{FOO} will result in equation number ‘4a’ (always ‘a’). It can only be used within $$ ... $$ . It does not affect the equation number counter, nor the ordinary partial equation number counter. However, it resets the partial equation number counter for the \rnreqno, \rreqno, \ddeqreqno, and \ddeqreqno commands. The argument of \rnreqno follows the same rules as that of \reqno. When used with the \label{FOO} command, a reference to FOO will only return the partial equation number (and the page number). To make a complete reference to an equation which has a \rnreqno command, say \ref{FOO}\ref{FOO}. This command is not compatible with the class option fleqn. Instead of $$ ... \rnreqno{FOO} $$, use a one-line deqrarr environment with the commands \deqreqno[-\jotbaseline]{FOO} \nonumber at the end.

\rreqno \rreqno{FOO}

Same as \rnreqno{FOO} but without resetting any equation number counter and giving consecutive partial equation numbers (‘4b’, ‘4c’, etc.). Note: There is nothing preventing the repeated use of \rnreqno{FOO} and \rreqno{FOO} for the same label FOO. This will result in numbering such as ‘3a’ (if FOO refers to equation ‘3’) occurring several times. This command is not compatible with the class option fleqn. Instead of $$ ... \rreqno{FOO} $$, use a one-line deqrarr environment with the commands \ddeqreqno[-\jotbaseline]{FOO} \nonumber at the end.

\eqreqno \eqreqno{FOO}[len]

This command is the array-like version of \reqno{FOO} and is used in much the same way. The optional argument len is a length which is added between consecutive rows in the array-like structure. When using \eqreqno no ‘\’ should be issued at the end of the line, it is embedded in the command. This is giving a strange appearance if \eqreqno is used on the last line of the array-like structure, namely an extra blank line (with equation number). To avoid this problem, specify a negative length for len, preferably ‘-\jotbaseline’ (see below), and issue a ‘\nonumber’ afterwards.

\deqreqno \deqreqno{FOO}[len]

This is the ‘\rnreqno’ version of ‘\eqreqno’ and is used as the former with the latter’s abilities at the end of a line.

\ddeqreqno \ddeqreqno{FOO}[len]

This is the ‘\rreqno’ version of ‘\eqreqno’ and is used as the former with the latter’s abilities at the end of a line.

\arrrlabel \arrrlabel{FOO}

This command is a version of \LaTeX’s ordinary \label{FOO} command meant to be used in deqarr and ddeqarr environments. In these environments, a \label{FOO} command gives a reference to the specific equation, e.g. 3b, whereas \arrrlabel{FOO} in the same position gives a reference containing only the main equation number, 3 in this example. For restrictions, see the section “Notice” above. The four commands \eqreqno, \deqreqno, \ddeqreqno, and \arrrlabel were created after inspiration from Larry Jones (schnuff@mit.edu).

\where \where
The command `\where` typsets the text “where” (in the default LR-font) flush left on a separate row in `eqnarray`, `deqarr`, `ddeqar`, and `deqrarr` environments, and preserves the environment’s alignment for rows to come.

\rem{text} \rem{text}

The command `\rem{text}` typsets the text “text” (in the default LR-font) flush left on a separate row in `eqnarray`, `deqarr`, `ddeqar`, and `deqrarr` environments, and preserves the environment’s alignment for rows to come. `\where` is equivalent to `\rem{where}`.

\nydeleqno \nydeleqno

Gives a new partial equation number when used within `$$ ... $$`. Thus, writing `$$ ... \nydeleqno $$` is equivalent to writing `\begin{deqn} ... \end{deqn}`. This command is not compatible with the class option `fleqn`, use `\begin{deqn} ... \end{deqn}` instead.

\deleqno \deleqno

Gives a partial equation number when used within `$$ ... $$`. Thus, writing `$$ ... \deleqno $$` is equivalent to writing `\begin{ddeqn} ... \end{ddeqn}`. This command is not compatible with the class option `fleqn`, use `\begin{ddeqn} ... \end{ddeqn}` instead.

\jotbaseline \jotbaseline

This is a rubber length which is set to be the sum of `\baselineskip` and `\jot` each time a `deqarr`, `ddeqar`, or a `deqrarr` environment is entered. It is meant to be used with the `\reqno` command and its relatives to eliminate the problems when these commands are used on the last line of the environment. (The length `\baselineskip + \jot` is the length \LaTeX skips between two empty lines in an ‘eqnarray’ environment and its derivates defined in `deleq`.)

4 Example

After running \LaTeX on `deleq.ins`, there is an example available in the file `delex.tex`, which makes use of all the environments and commands defined in the `deleq` package. Type it and see with your own eyes what the results are!

5 Sending a Bug Report

deleq is most likely to contain bugs. Reports of bugs in the package are most welcome. Before filing a bug report, please take the following actions:

1. Ensure your problem is not due to your inputfile;
2. Ensure your problem is not due to your own package(s) or class(es);
3. Ensure your problem is not covered in the section ”Known Problems” above;
4. Try to locate the problem by writing a minimal \LaTeX input file which reproduces the problem. Include the command
   \begin{verbatim}
   \setcounter{errorcontextlines}{999}
   \end{verbatim}
in your input;
5. Run your file through \LaTeX;
6. Send a description of your problem, the input file and the log file via e-mail to: matsd@sssk.se
Enjoy your \LaTeX!

mats d.
6 The Code

For the interested reader(s), here is a short description of the code.

First, the package is to identify itself.
\NeedsTeXFormat{LaTeX2e}[1996/12/01]
\ProvidesPackage{deleq}[1997/07/07 v.4.41 Partial equation numbering]

Then, we need to define the counters used for the partial part of the equation number. The counter Deleq is used for "recycled" equation numbers, hence no dependence on any other counter.
\newcounter{deleq}[equation]
\newcounter{Deleq}
\newlength{\jotbaseline}
\renewcommand{\thedeleq}{\ensuremath{\theequation\mathrm{\alph{deleq}}}}
\renewcommand{\theDeleq}{\ensuremath{\mathrm{\alph{Deleq}}}}
\def\@deleqnnum{\@deleqrnum{\ref{#1}}}
\def\@deleqrnum#1{\@deleqnnum{\ref{#1}\theDeleq}}

The parts making up the \textbackslash command in the multiline environments are similar to those used by the standard environments (at least how they looked some time ago):
\def\@deqncr{{\ifnum0=`\fi}\@ifstar{\global\@eqpen\@M\@ydeqncr}{\global\@eqpen\interdisplaylinepenalty \@ydeqncr}}
\def\@ydeqncr{\@ifnextchar \[\@xdeqncr}{\@xdeqncr\[\z@]}\@dequeqncr[\[\z@\]]{\ifnum0=`\fi}\@@deqncr{\@tempa{& & &}}\@tempa{\if@eqnsw\@deleqnnum\stepcounter{deleq}\fi}\global\@eqnswtrue\global\@eqcnt\z@\cr}
\def\@ddeqncr[#1]{\@ifnextchar \[\@ddeqncr}{\@ddeqncr\[\z@\]]{\ifnum0=`\fi}\@@deqncr{\@tempa{& & &}}\@tempa{\if@eqnsw\@ddeleqrnum{\@deleqnum{\ref{#1}}}}\global\@eqnswtrue\global\@eqcnt\z@\cr}
\def\@ddeleqrnum{\@deleqrnum{\ref{#1}}}
\def\@ddeleqnum{\@deleqnum{\ref{#1}}}
\def\@ddeqnum{\@eqnum{\@eqnum{\ref{#1}}}}
\def\@dequeqnum{\@eqnum{\@eqnum{\ref{#1}}}}
\def\@ddeqrcr[#1]{\@ifnextchar \[\@ddeqrcr}{\@ddeqrcr\[\z@\]]{\ifnum0=`\fi}\@@eqncr{\@tempa{& & &}}\@tempa{\if@eqnsw\@deleqrnum{\@deleqnum{\ref{#1}}}}\global\@eqnswtrue\global\@eqcnt\z@\cr}
\def\@ddeqrcr[#1]{\@ifnextchar \[\@ddeqrcr}{\@ddeqrcr\[\z@\]]{\ifnum0=`\fi}\@@eqncr{\@tempa{& & &}}\@tempa{\if@eqnsw\@ddeleqrnum{\@deleqnum{\ref{#1}}}}\global\@eqnswtrue\global\@eqcnt\z@\cr}
\def\@ddeqrrcr[#1]{\@ifnextchar \[\@ddeqrrcr}{\@ddeqrrcr\[\z@\]]{\ifnum0=`\fi}\@@eqncr{\@tempa{& & &}}\@tempa{\if@eqnsw\@ddeleqrnum{\@deleqnum{\ref{#1}}}}\global\@eqnswtrue\global\@eqcnt\z@\cr}
Here the definitions of the user commands are.

\newcommand{\nydeleqno}{\stepcounter{equation}\stepcounter{deleq} \eqno \theequation}
\newcommand{\deleqno}{\refstepcounter{deleq} \let\@currentlabel\thedeleq \eqno \theequation}
\newcommand{\reqno}[1]{\setcounter{Deleq}{-1}\refstepcounter{Deleq} \eqno \ref{#1}}
\newcommand{\rdeqno}[1]{\refstepcounter{Deleq} \eqno \ref{#1}\theDeleq}
\newcommand{\rndeqno}[1]{\setcounter{Deleq}{0}\refstepcounter{Deleq} \eqno \ref{#1}\theDeleq}
\newcommand{\eqreqno}[2][0pt]{{\ifnum0=`}\fi\@ifstar{\global\@eqpen\@M \@xeqrcr{#1}{#2}}{\global\@eqpen\interdisplaylinepenalty \@xeqrcr{#1}{#2}}}
\newcommand{\deqreqno}[2][0pt]{\setcounter{Deleq}{0}\refstepcounter{Deleq} \ifnum0=`\fi\@ifstar{\global\@eqpen\@M \@xdeqrcr{#1}{#2}}{\global\@eqpen\interdisplaylinepenalty \@xdeqrcr{#1}{#2}}}
\newcommand{\ddeqreqno}[2][0pt]{\refstepcounter{Deleq} \ifnum0=`\fi\@ifstar{\global\@eqpen\@M \@xdeqrcr{#1}{#2}}{\global\@eqpen\interdisplaylinepenalty \@xdeqrcr{#1}{#2}}}
\newcommand{\arrlabel}[1]{\let\@currentlabel\theequation \label{#1}}
\newcommand{\nydeqno}{\stepcounter{equation}\stepcounter{deleq}}
\newcommand{\heqno}{\stepcounter{equation}}
def\where{\let\@tempa\relax \def\@tempa{& & &} \@tempa \hbox to .01\p@{}\rlap{\hskip -\displaywidth where}}
\rem#1{\let\@tempa\relax \def\@tempa{& & &} \@tempa \hbox to .01\p@{}\rlap{\hskip -\displaywidth #1}}

The five environments are slight modifications of the corresponding \LaTeX standard environments. The main difference lies in which counter(s) is stepped and which internals are used to finish off the lines. Three of them have large parts in common, parts which are put in one macro \&\@dlinev:\n
\def\@dlinev{\setlength{\jotbaseline}{\baselineskip} %}
\addtolength{\jotbaseline}{\jot} \global@eqnsvrue\@m@th
\global\@eqcntzw@\tabskip\centering
$\$$align to/displaywidth/\hboxgroup/\@eqnsel\hskip\@centering
$\$$displaystyle/\tabskipzw@\@eqcntone
\hskip2\arraycolsep \ht\hfil$\#\@eqcnttw@\hfil
\&\global@eqcnttwz@\hskip2\arraycolsep $\$$displaystyle/\tabskipzw@\@eqcnttwz@\hfil
\tabskip\centering\@llap{\#}\@llap{\#}\hfil\tabskipzw@\cr
\newenvironment{deqarr}{\stepcounter{equation}\stepcounter{deleq}}{\enddeqarr}
\let\@currentlabel\theequation \let\@@deqncr\@dlinev
\@deqncr\groupe
\global@advance\@c@deleq\@ne\global@ignoretrue
\newenvironment{ddeqar}{\stepcounter{deleq}}{\enddeqarr}
\let\@currentlabel\theequation \let\@@deqncr\@dlinev
\@deqncr\groupe
\global@advance\@c@deleq\@ne\global@ignoretrue
\newenvironment{ddeqn}{\refstepcounter{deleq}}{\enddeqarr}
\let\@currentlabel\theequation \let\@@deqncr\@dlinev
\@deqncr\groupe
\global@advance\@c@deleq\@ne\global@ignoretrue
\newenvironment{deqreqno}[2][0pt]{{\ifnum0=`}\fi\@ifstar{\global\@eqpen\@M \@xeqrcr{#1}{#2}}{\global\@eqpen\interdisplaylinepenalty \@xeqrcr{#1}{#2}}}
\newenvironment{deqreqno}[2][0pt]{\setcounter{Deleq}{0}\refstepcounter{Deleq} \ifnum0=`\fi\@ifstar{\global\@eqpen\@M \@xdeqrcr{#1}{#2}}{\global\@eqpen\interdisplaylinepenalty \@xdeqrcr{#1}{#2}}}
\newenvironment{ddeqreqno}[2][0pt]{\refstepcounter{Deleq} \ifnum0=`\fi\@ifstar{\global\@eqpen\@M \@xdeqrcr{#1}{#2}}{\global\@eqpen\interdisplaylinepenalty \@xdeqrcr{#1}{#2}}}
If the user wants the equation numbers to the left, we have to modify some of the commands and internals defined above. This is done in a `\DeclareOption'-call, but first we set a switch to test for the `leqno' option. Initially, it is set to F and then changed to T if the `leqno' option is in effect.

The `fleqn' option is mainly a 'deleq'-ification of the \LaTeX2e file `fleqn.clo' (1995/06/26 v1.3g). If both `leqno' and `fleqn' options are in use, the length `\mathindent' should be increased to allow space for the letters of the partial equation numbers. For the multiline environments, it is enough to make changes to the internal \@eqrnum.
If other options were asked for, the package should make these options ‘unused’. Then, last, the option(s) is (are) processed.

\DeclareOption*{\OptionNotUsed}
\ProcessOptions

That is all. Happy \TeX-ing!

\hspace{\linewidth}\begin{deqn}
\end{deqn}